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Second Session: Dunedin, February 3 to 10, 1927



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SECTION IV.—PATHOLOGY AND BACTERIOLOGY.

TUMOURS OF THE THYROID GLAND.

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(Continued from page 351.)

In other places not shown in the Figure there was a solid alveolar structure, groups of cells separated from other groups only by a delicate connective tissue containing capillary vessels or merely by an endothelial tube. This resembles parathyroid structure very much and is similar to the tumour in Case XIV, but there are a few colloid alveoli scattered through these areas. It seems to throw doubt on the parathyroid origin of the tumour of Case XIV and to show that thyroid adenomata may produce this type of formation. We cannot find any oxyphil cells. This structure also resembles that of *carcinoma simplex*, but the appearances otherwise do not suggest malignancy. It was classified as an adenoma (see Figure IX).

CASE VII (reference number G379, from Sydney Hospital through Dr. Keith Inglis).—P., *atatis* fifty-eight years at operation, had a thyroid enlargement for four years with dyspnoea. There were no toxic symptoms, but rather signs of hypothyroidism, namely slow speech, clumsiness and thinning of the eyebrows. At operation two encapsulated tumours were shelled out, both spherical, one six centimetres in diameter, the other two centimetres, both solid with smooth capsules. The cut surface of the larger one revealed a large central hæmorrhagic area and pale peripheral areas. On microscopical examination it was seen that the tumour had a dense fibrous tissue capsule. The greater part of the tumour consisted of minute alveoli or columns of cells or tubules, with a little colloid in some of them or in slightly larger alveoli. The epithelium was cubical but in places high cubical. The stroma was very delicate and the blood vessels very thin walled and there were hæmorrhages in places. In other areas and particularly at one end of the tumour this tissue merged into another consisting of medium and large alveoli with low cubical epithelium and abundant colloid. The appearance suggested that the minute alveoli, columns and tubules of the more active looking tissue were growing into the other tissue. The figure shows the junction of these two tissues. The tumour is classified as an adenoma (see Figures X and XI).

CASE VIII (reference number F604).—G.N., male, *atatis* twenty-eight years, had an enlargement of the thyroid noticed for about two months. There were no toxic symptoms. On examination it was found that the thyroid gland was not generally enlarged, but there was a spherical lump in the suprasternal notch to the left of the mid-line. At operation the tumour was separated from the isthmus by



FIGURE X.
Adenoma: Case VII. Diameter 6 cm. Central hæmorrhages.

cutting, so that it may not have been completely encapsulated. It was ovoid on cross section, about two centimetres by one and a half centimetres and solid. The histology of part of it is seen in Figure XIII. There was a fibrous capsule and compressed thyroid tissue outside it. The tumour consisted of small and very small alveoli for the most part, some containing colloid, staining faintly or deeply. The epithelial cells were cubical or flattened. There were also numerous groups and even columns of thyroid cells without alveoli and they were distributed between the alveoli or formed areas of this tissue. The blood vessels were medium-sized with a moderately thick wall, but some

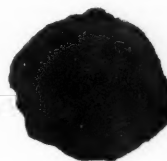


FIGURE XII.
Adenoma: Case VIII. Diameter 2 cm.

were very thin walled, particularly the smaller ones and the tumour was vascular in places. The connective tissue was scanty and was absent in places as if there were non-staining fluid in the interstices (œdema or mucinous degeneration). Altogether the appearances suggest much new formation of alveoli and a tendency to produce colloid as these increase in size. It is classified as an adenoma of the thyroid. (see Figures XII and XIII).

CASE IX (reference number 29,611).—R.C.H., Male, *atatis* thirty-three years at the operation in 1914, had an enlargement of the neck in the mid-line for eighteen months, which was growing. His voice was husky. There were no pressure effects on the trachea and œsophagus and no toxic symptoms.

At the operation the tumour was shelled out and the isthmus and left lobe were removed. The patient was dis-

charged well. Microscopical examination revealed a thick capsule and a very cellular interior with little stroma. In places it resembled the fetal type of structure, minute alveoli or clusters of cells or narrow columns or tubules. In places there were a few alveoli containing colloid. In other places there were larger groups or columns of cells separated by a thin network of fibrous tissue and this structure resembled that of *carcinoma simplex* of other viscera, though the cells and nuclei had a uniform appearance. The vessels were thin-walled and a large venous sinus had epithelial columns right against its thin wall. This does not necessarily mean that there is an invasion of the vessel, but rather that there is a very close proximity owing to the thinness of the vessel wall. The diagnosis at the time was carcinoma of the thyroid. This patient could not be traced, but his death has not been registered in New South Wales since that time (1914), so that it is not improbable that he still lives and that the tumour was an adenoma (see Figure XIV).

CASE X (reference number F98).—W. C. male, *etatis* sixty-four years at the operation, had an enlargement on the left side of the neck for two and a half years. He also had an epithelioma of the lip. The left lobe of the thyroid was removed at the same time as the lip and the glands of the neck.

The tissue said to be left lobe was a large ovoid solid mass measuring 7.5 by 4.5 centimetres, completely encapsulated. It consisted of colloid-containing alveoli of all sizes, many small and showing active function, but there were also hemorrhages and degenerate connective tissue and large spaces, apparently degenerate alveoli with very flat epithelium or none at all. There were in these areas groups of minute alveoli and tubules apparently growing into this degenerate stroma or possibly the minute tubules and alveoli went on to form large alveoli with flat epithelium and degeneration subsequently followed. The section shows the advanced degenerative changes in an adenoma from an old man (see Figure XV).

CASE XI (reference number F425).—A. C., female, married, *etatis* thirty-eight years, had an enlargement of the thyroid on the right side for twelve years, which had increased rapidly during the last two years before operation. No toxic symptoms had appeared. At the operation a large spherical tumour about 7.5 centimetres in diameter was shelled out. It ruptured during manipulation and yellow fluid mixed with dark blood escaped. Its cut surface was greyish and revealed large, slit-like spaces into which obvious papillae proliferated and also hemorrhages into the cystic spaces under the capsule. The patient made a good recovery.

On microscopical examination areas consisting of varying sized alveoli and oedematous or degenerate stroma were seen, the alveoli containing no colloid or pale colloid or colloid with numerous peripheral vacuoles and the epithelium high cubical or columnar and closely packed together. There were other areas in which numerous papillary processes hung in slit-like or racemose spaces which may have contained some vacuolated, degenerate colloid or old blood. The early stage of papillary formation was well seen in some alveoli.

The appearances certainly suggest active growth. The tumour was classified as an adenoma with a tendency to progress to papillary adenoma. Note the taller epithelium and the more vesicular nuclei than in the fetal types (see Figure XVI).

CASE XII (reference number C62, Museum 356).—W. B., male, *etatis* forty-six years at operation, had an enlargement in the right lobe of the thyroid for four months; it was increasing in size. There was a sensation of pressure, but no toxic symptoms. On examination a firm, cystic, painless, rounded and movable tumour was found on the right side. The right lobe was removed. It contained an ovoid encapsulated tumour, measuring four by three centimetres with a mottled dark and greyish cut surface. The patient is alive and well without recurrence four years later. The tumour is an adenoma of very undifferentiated type, mostly wavy columns of epithelial cells separated by endothelial tubes, but here and there are colloid containing acini. There are many hemorrhages,

particularly towards the centre of tumour. The unusual structure and the presence of occasional large eosinophile cells make one bear in mind the possibility of parathyroid tissue origin, but the tendency to produce acini and colloid, though perhaps not decisive, makes one incline to a thyroid origin. We are still in doubt (see Figures XVII and XVIII).

CASE XIII (reference number 15,207).—T. R., male, *etatis* twenty-seven years at operation, had an enlargement on the left side of the neck for four months. He had difficulty in swallowing, dyspnoea when lying down and cough. His voice was getting weaker. There were no toxic symptoms.

On examination a rounded mass was found above the sterno-clavicular junction on the left side. At operation a tumour and portion of the thyroid were removed. On cutting into the specimen a hard pale irregular mass was



FIGURE XVII.
Adenoma: Case XII. 4 cm. x 3 cm.

found imbedded in tissue like thyroid. The patient left hospital. It is now fifteen years ago and the patient could not be traced, but his death has not been recorded in New South Wales. He may have died in another State. The histology is illustrated in Figure XIX. It had a dense fibrous capsule in which were calcific deposits. The tissue around it was thyroid. The tumour consisted of very small alveoli for the most part, mostly without colloid, but largely also of small groups and columns of cells without lumina somewhat like a fetal thyroid. There were also medium sized alveoli containing colloid. The connective tissue was probably oedematous fibrous tissue. There were some medium sized blood vessels within it and the epithelial cells lay very close to their walls. There were a few groups of epithelial cells and small alveoli in the capsule. It was thought to be malignant at the time, but our study of these tumours inclines us to a diagnosis of adenoma, probably of thyroid origin.

CASE XIV (reference number D71).—E. E. H., female, married, *etatis* fifty-four years at operation in 1923, had an enlargement for three years in the mid-line extending down to sternum and slightly to the left, soft and movable. There was pain for two months and cough. No toxic symptoms were present, but the features were heavy and the face and forehead large and prominent.

At operation the tumour was shelled out. It appeared to lie in the isthmus. She was discharged well. It was a solid tumour, ovoid, measuring 6 by 4.5 centimetres, compressing the adjacent thyroid tissue.

Microscopically it was seen to be encapsulated and consisted of solid groups of rounded or polygonal cells separated by delicate bands of connective tissue in which lay numerous capillary vessels. The structure suggests parathyroid. There were no alveoli and no colloid could be found except that a very few cells contained a small vacuole or droplet which stained somewhat like faintly staining colloid. No oxyntic cells were found. The tumour was classified as a parathyroid adenoma. The after history of this patient since the operation three years ago has not yet been ascertained (see Figure XXI).

Reference number (*post mortem* notes) 4,388: Adenoma of the pancreas, interpolated to show a similar and undoubted adenoma from another organ developed from the primitive gut. The adenoma was completely encapsulated and contained no ducts. It consisted mainly of curving columns of cells, mainly columnar, separated by delicate connective tissue, but here and there and more in some parts than others acini or alveoli were found (see Figure XXI).

Malignant Tumours.

The subject of malignant tumours is a somewhat vexed one and presents some puzzling and as yet imperfectly explained features. There is the usual questions as to whether they originate in embryonal or adult tissue. Ewing inclines to the opinion that tumours of the thyroid fall into two groups, embryonal and adult, and each group includes forms of adenomata and carcinomata. Most of the malignant tumours that are figured, appear to be of the adult type, however, and our small series are of this type. The idea that malignant tumours are rare is due, according to L. B. Wilson (quoted by McFarland⁽⁷⁾) to erroneous diagnosis. Even at the Mayo clinic, of ninety-seven malignant growths removed, twenty-three were at first not reported upon as such. This means that surgeons should follow up their patients with adenomata. On the other hand, however, we think that some cases of Riedel's struma are classified as malignant and some adenomata thought to be malignant histologically, are said to be simple clinically and we have had experience of this. Also there are the curious cases that we have described, in which adenomatous tissue spreads about the neck without palpable evidence of any primary thyroid focus. In the Mayo Clinic 1.19% of goitres were malignant and 69% occurred in females. According to Ewing carcinoma is usually a disease of advanced life, commonest between fifty and sixty. The history of preceding goitre is very common. Ehrhardt found it in 104 of 200 cases. L. B. Wilson found that of 290 patients with malignant tumours, 158 had developed goitre before the age of thirty, 159 had had enlargement for at least five years and only 61 had not noticed an enlargement for more than one year. An increasing rapidity of enlargement is said to be suspicious of malignancy. According to Ewing, the average duration of carcinoma is about two years, adeno-carcinoma being usually slower (less malignant) than carcinomata and papillary adeno-carcinomata are still slower. It is interesting to note that they are usually described as primarily encapsulated tumours, like the adenomata and invasion of their blood vessels or of their capsules is usually the method of spread rather than by lymph channels. Ewing gives the site of secondaries in this order: lungs, bones, liver, kidneys, pleuræ and brain. The flat bones, particularly those of the cranium, are frequently selected. It is said that the structure of the primary growth may be malignant and the secondary simple and *vice versa*.

A somewhat different view is expressed by Bland Sutton⁽⁸⁾ (1922) who states that in England carcinomata of the thyroid are "extremely rare" and that surgical removal is practically hopeless on account of local invasive characters, but that metastases are uncommon.

The following types of malignant epithelial growths have been described:

Carcinoma or Carcinoma Simplex.

Simple carcinomata are encapsulated tumours at first and composed of solid masses or columns of cells with relatively little connective tissue; there is

relatively little formation of acini or production of colloid; this may infiltrate locally and produce metastases. According to Marine they originate in fetal adenomata. In most statistics this constitutes the commonest type, 50% of all forms and the malignant type met with in childhood and early adult life according to Marine. The trachea and oesophagus may be compressed or invaded.

Scirrhus Carcinoma.

Scirrhus carcinomata are non-encapsulated tumours. They are classified by Ewing as a variety of the former. According to Marine it is a rare form. We consider that it is probable that Riedel's struma has been confused with this type of carcinoma and also with the sarcomata; Marine's description lends colour to this suggestion.

Several examples have been described where the outlines of thyroid lobes slightly or moderately enlarged are preserved. Such glands are extremely hard. On section, the tumour resembles a diffuse, extreme fibrosis, which extends into the non-tumour thyroid without any line of demarcation. Microscopically, in the older parts there may be no glandular elements left.

This description should be compared with the picture shown of Riedel's struma and with Simmond's drawings of the histology in chronic thyroiditis. McFarland, however, figures a typical scirrhus carcinoma from Wilson's series.

Malignant Adenoma or Adeno-Carcinoma.

Malignant adenomata are encapsulated tumours, likely to infiltrate locally but not rapidly; they may recur after excision and are said not to form metastases as often as carcinomata. The acinar epithelium may be cuboidal or columnar and they form acini of varying size and variable amounts of colloid. The distinction from simple adenoma will sometimes be difficult. Both Marine and Wilson suggest that they originate in the more adult types of adenomata. Crotti's figures of malignant adenomata rather suggest carcinomata. We agree with the opinion of Wilson that sizable adenomata manifesting active cellular proliferation in people of cancer age should be regarded as potentially malignant. The after history of the patients should be carefully followed.

Papillary Adeno-carcinoma, Papillary Cystic Carcinoma or Malignant Papilloma.

Papillary adeno-carcinoma, papillary cystic carcinoma and malignant papilloma are terms given to an interesting type of encapsulated tumours which are macroscopically partly solid, partly cystic and are sometimes multiple. The distinction from papillary adenoma may be difficult. As with all these tumours in the present state of our knowledge, the criterion of malignancy is not the histological structure alone, but an accurate after history. There are abundant papillary projections into complex cystic spaces and possibly small amounts of colloid. Ewing says that they are usually preceded by a chronic enlargement of the thyroid and growth is relatively slow. The epithelium lining the papillæ and recesses may be cuboidal, columnar or syncytial and may be several layers thick and the

appearances certainly suggest an origin from adult thyroid tissue. There may be recurrences after excision.

Squamous Carcinoma.

Squamous carcinoma may contain the formation of typical pearls or cell nests. This tumour is described by Crotti and by Marine but is rare. We could not find an authentic case in fifteen years at the Royal Prince Alfred Hospital. Its supposed origin from the thyreo-glossal tract or branchial clefts must be taken with reserve since squamous cell metaplasia has been described in the thyroid gland even in non-tumour conditions, for example, in myxœdema by Nicholson.

In addition to the above well-recognized types there are several other interesting but puzzling tumour formations. The first is the so-called metastasizing colloid goitre. There is a simple, colloid goitre and there may be simple adenomata and yet metastases occur, commonly in bones but also in the lungs and elsewhere. The metastases commonly consist of colloid-containing alveoli without malignant structure. There is no doubt that very careful microscopical examination of the thyroid would be necessary to exclude any possible malignancy if the thyroid were the seat of adenomata and the latter have been described in some of the cases. But it is remarkable that the metastases should usually present a normal structure. The patients may live for many years.

There is another variety called metastases from the normal thyroid, in which the goitrous enlargement is absent. Ewing says of these: "In explanation of these cases it seems necessary to assume an origin either from aberrant thyroid tissue or from dislodged cells from the normal thyroid. Yet in none of the cases has the supposed normal thyroid been submitted to microscopical examination."

The next type is the so-called parastruma, a malignant growth which is said to originate in parathyroid tissue. It is described by Crotti as having a nodular appearance, soon becoming adherent to adjacent tissues, is hard in consistency and causes early pressure symptoms. It consists of two types of cells, large polyhedral cells with vesicular nuclei and clear cytoplasm, sometimes containing glycogen granules and also smaller cells with eosin-staining cytoplasm and no glycogen; between the solid groups lie glandular tubules lined by cylindrical epithelium with nuclei near the free margin. Crotti considers that they are usually developed from the remains of aberrant parathyroid tissues described by Getsowa in the thyroid gland. They metastasize in lungs, bones and lymph glands.

Finally there is the post-branchial goitre. This is an adeno-carcinoma which is distinguished by Crotti from the parastruma, and forms large nodules distinct from the rest of the thyroid. It consists of small alveoli which may contain colloid and is peculiar in that the cells lining the alveoli are large polyhedral cells with granular eosinophilic cytoplasm and they are said to resemble liver cells or adrenal cells. Glycogen is absent. Both Crotti and Ewing favour an origin

from the remains of the post-branchial or ultimobranchial bodies described by Getsowa in the normal thyroid. We have not recognized any of these rarer types of tumour.

Sarcomata of the thyroid appear to be numerous in the older statistics, but there is good reason to believe that many were carcinomata. Ewing goes so far as to cast doubts upon their occurrence in the thyroid at all, but Wilson records nineteen sarcomata in 290 malignant tumours of the thyroid, a much lower figure than the older statistics. Crotti gives the principal forms as fibro-sarcoma and round-cell sarcoma.

We shall have nothing to say about mixed tumours (sarcoma-carcinoma). They lie under grave suspicion.

Details of Malignant Tumours of the Thyroid at the Royal Prince Alfred Hospital.

In the records extending over fifteen years there occur, sometimes unavoidably, cases that are not sufficiently investigated for the purposes of accurate classification. These we have omitted altogether. It is a comparatively rare disease in Sydney apparently, for there remain only five cases which we can present to you. One is a carcinoma producing metastases in cervical lymph glands, but as yet no metastases have been recognized in internal organs; there are three cases classified as adeno-carcinomata, all of the papillary type, and one fibro-sarcoma. Of the three papillary tumours two are undoubted, one produced numerous metastases in the lungs and other organs and death six months after operation; the other resulted in death two years after operation with clinical evidence of metastases in the chest and abdomen; the other patient died five years later from malignant disease of the liver (*sic*). The fifth case classified as fibro-sarcoma had a fatal ending one month after operation. The average age of the patients was fifty-one, the oldest fifty-five, the youngest forty-three. There were two males and three females. The history of enlargement, in months preceding operation was respectively six, ten, one hundred and twenty, twenty-four and sixty. In only two cases was there evidence of metastases in internal viscera; in one case the metastatic tumour grew somewhat slowly in the lower cervical lymph glands; in no case was there evidence of metastases in bones. Two of the five patients died mainly from local recurrence and extension. The opinion of Bland Sutton is rather borne out, namely, that these tumours are often difficult of complete removal. As so many are at first encapsulated, the indications for early recognition and excision in people in middle age of all growing adenomatous masses, whether in the thyroid or away from it, seem to be clear.

Case Reports.

CASE I. *Carcinoma simplex*, primary tumour (reference number E252).—A. I., male, *ætatis* forty-three years at operation, had a swelling in the right side of the neck for six months. He had no dysphagia nor toxic symptoms. On examination a hard mass the size of a small orange was discovered in the right lobe of thyroid, moving with deglutition. It was excised and found to be a carcinoma. Eighteen months later an enlarged lymph gland was removed from under the right sterno-mastoid, but no metas-

tases were found. Five months later, that is two years after the first operation, another lump thought to be an enlarged lymph gland was removed from the right posterior triangle. This was found to be an encapsulated tumour about two centimetres in diameter, sections of which showed no lymph gland tissue, but a carcinomatous growth not very different from the thyroid growth. It was thought to be a lymph gland replaced by metastatic growth.

The thyroid growth consisted of solid masses of cells and also acini lying in a fibrous tissue stroma. The acini had columnar epithelium, the outlines of the cells in the masses could not be seen, but the nuclei were oval. Many of the acini lay in cell masses and many contained colloid. Deposits of calcium salts were in the fibrous stroma. There was a capsule which was invaded. It was a carcinoma of a solid type, but with some acinous formation, but not at all papillary. The vessels were thin walled and there was not much hæmorrhage (see Figure XXII).

CASE I (continued). Metastasis or recurrence in the posterior triangle (reference number G130).—The specimen is a section of part of a mass about two centimetres in diameter in right posterior triangle of the neck, thought to be an invaded lymph gland, but microscopically no lymph gland tissue was found in the section; a mass of carcinoma not very unlike the thyroid tissue removed two years before. It consists of masses of cells tending to be of columnar type and numerous small droplets of colloid which stain deeply and lie in small acini in the masses. The vessels are thin walled sinuses and hæmorrhages are numerous, but necrosis is not noted. The growth of metastases in this patient is apparently very slow and is not associated with cachexia, though the structure is undoubtedly malignant. He is alive and fairly well (see Figure XXIII).

CASE I (continued, reference number G130).—Figure XXIV is another (low power) view of the metastasis, showing the solid masses of cells and the hæmorrhages and well formed fibrous tissue stroma.

CASE II. Papillary adeno-carcinoma (reference number B325).—F.S., male, *atatis* fifty-five years at operation, had an enlargement of the thyroid near the middle line for ten months, increasing in size; lately it had become painful. There was no dyspnoea or dysphagia. There was no previous history of goitre. The patient had no toxic symptoms. On examination a hard, not cystic, smooth mass the size of a hen's egg, was found more on the right than the left side. The right lobe and tumour were removed and also lymph glands along internal jugular vein, one of which contained metastases. Seven months later lumps appeared behind the upper part of the right sterno-mastoid. These were removed and also the internal jugular vein up to the base of the skull. A year later he was very ill with metastases in his chest and abdomen and had signs of a failing heart. He lived for just two years after the first operation and in the death certificate the cause was given as carcinoma of the thyroid.

The structure was that of a papillary adeno-carcinoma, but there was only a trace of colloid and the connective tissue was abundant in the form of fibrous bands which were infiltrated by alveoli in the way that acini infiltrate the wall of the bowel in adeno-carcinomata. There was a complex system of papillary processes. The epithelial cells were more cubical than columnar. Nuclei were somewhat vesicular, irregular in size and vacuolation was seen, but mitotic figures were not noted. There was some diffuse infiltration also of the connective tissue. The lapse of two years does not suggest high malignancy (see Figure XXV).

CASE III. Papillary adeno-carcinoma, a primary tumour (reference number 24,532).—C.W., female, married, *atatis* fifty-five years at operation, had a thyroid enlargement on the right side for ten years. The symptoms were throbbing in the head, aching in the lump, breathlessness, difficulty and pain on swallowing solid food. Her voice was husky and she had a dry cough. There were no toxic symptoms. On examination great enlargement of the right lobe was noted, less of the left. The gland had to be removed piecemeal and the trachea could not be cleared of

growth. Four months later the patient was readmitted with pain and swelling in the isthmus region and dysphagia. Broken down pieces of gland and blood clot were evacuated, but the skin became infiltrated and death took place one month later preceded by breathlessness and delirium, that is six months after the first operation.

At the autopsy a fungating necrotic growth was found infiltrating the tissues of the neck, but not perforating the trachea. Numerous metastases were found in the lungs, pleuræ, pericardium and a large one in the mediastinum. The structure was undoubtedly malignant, an adeno-carcinoma with papillary characters in most parts, though forming large compact masses in others. There were only traces of a stainable secretion which may have been atypical colloid. Many of the papillary processes were long and the cystic spaces very racemose. The epithelium was columnar, the nuclei somewhat irregularly oval and staining deeply. As in Case II there were fibrous tissue bands in the tumour which were often invaded and the capsule was also invaded. The structure of these papillary adeno-carcinomata suggests an ingrowth of papillæ in a thyroid cyst and the malignancy apparently varies; it is suggested that the absence of colloid is associated with more malignant characters (see Figure XXVII).

CASE III (continued). Metastasis in lung (*post mortem* notes 1902). The specimen is a section of a metastasis of thyroid adeno-carcinoma in the lung. The alveolar structure of the lung is still to be seen in most parts of the tissue, but around vessels a solid infiltration is sometimes to be seen. There is little doubt that the nodules in the lung were metastases, though the structure is very different from the primary growth (see Figure XXVIII).

CASE IV. Papillary adeno-carcinoma, possibly papillary adenoma (reference number 11,513).—E.P., female, married, *atatis* forty-eight years at operation, had an enlargement of the neck for two years, increasing gradually. On examination a tumour was found in the isthmus. There were no enlarged lymph glands. The patient had not lost weight and had no toxic symptoms. Pressure symptoms were not mentioned. At the operation the tumour was not easy to remove for it did not shell out. The isthmus was removed with the tumour. The histology is shown in Figure XXVIII. It had a capsule which consisted mainly of compressed thyroid tissue. There were a few fibrous trabeculæ passing into what were four very complex cystic spaces and long branching papillary processes lined by columnar epithelium with deeply staining nuclei projected from the wall and the trabeculæ. In some of the papillæ were acini, a few of which contained colloid. In the section we could see no definite evidence of invasion of the surrounding thyroid, but the whole tumour was not sectioned. Certainly the proliferation was very free and the cells stained very differently from normal thyroid cells and it was thought to be probably malignant (papillary adeno-carcinoma).

The patient died five years later, at the age of fifty-three. There was no autopsy. In the death certificate the cause is given as malignant disease of the liver; exhaustion. No certain conclusions can be drawn as to whether this was a metastasis from the thyroid or not. There is no mention of a thyroid recurrence nor is the liver a common site for metastases, so that it is not unlikely that it was not a thyroid metastasis. I have classified this case as a papillary adeno-carcinoma (papillary adenoma).

CASE V. Fibro-sarcoma (reference number 27,479).—A.A., female, single, *atatis* fifty-three years at operation and death, had an enlargement of the neck for five years. She had loss of voice and was able to whisper only for six weeks. There was no loss of weight and she had no toxic symptoms. On examination a uniform enlargement of the thyroid was found, but with a marble-like elevation at the isthmus. The left lobe and isthmus were removed and in doing so small openings were found in the trachea. After discharging, it healed in a month and the patient went out with a wheezing respiration but died two days later. In the death certificate the cause is given as malignant goitre, asphyxia and heart failure. There was no autopsy. The tissue removed at operation consisted of connective tissue without any epithelial elements or thy-

roid tissue. It consisted of fibrous areas and areas consisting of spindle-shaped cells and small round cells. There were a very few immature multinucleated giant cells. The small round cells were sometimes in groups, sometimes around small thin walled vessels. We have classified it as a fibro-sarcoma of the thyroid, but it is difficult to exclude some form of granuloma. The early death of the patient is in favour of the former (see Figure XXIX).

CASE VI. A lateral cervical recurrent tumour apparently originating not in the thyroid but in the carotid body (reference number 10,576).—M.B., female married, *etatis* forty-nine years at operation. At forty-two years after a rough grip on the neck a small lump the size of a pea appeared and increased in size. There was some bleeding from the ear. On examination an expansile, pulsating tumour was detected below the left ear. At the operation a vascular tumour, not an aneurysm, was found about the bifurcation of the common carotid and around the internal carotid artery and extending up to the base of the skull. It had to be removed piecemeal. Three years later, at fifty-two years, after much bleeding from the left ear, a polypus and some of the mastoid bone were removed. The former comprised only inflammatory tissue, but the latter consisted of a doubtful fibro-cellular tissue in wide interosseous areas and it was thought to be a fibro-endothelioma, doubtless an extension of the original tumour. After a further three years, at fifty-five years, the bleeding recurred and a lump appeared behind the ear, but after a vomiting attack the ear went "click" and the lump disappeared. After a further ten years, at age of sixty-five, the patient is in fair health. There is deafness in left ear. There is a sinus behind this ear and some discharge from this and from the meatus. In a mass of fibrous tissue behind the ear the carotid artery can be seen to pulsate and even the pinna pulsates. There are no lumps in the neck and the thyroid is not enlarged. Obviously it was a tumour with relatively benign characters and closely associated with the blood vascular system.

The original tumour consisted of small cell masses, each like a syncytium, separated from adjoining masses by a delicate but well formed fibrous tissue network. There were bands of fibrous tissue passing through the tumour and some of these contained venules or blood sinuses. In the tumour were numerous vessels with only an endothelial wall and some areas contained hæmorrhages. There was a capsule which showed some invasion by the growth. The structure is not that described for peritheliomas (of the carotid body) (see Figure XXX).

Acknowledgments.

We acknowledge our indebtedness for clinical and pathological material to the Honorary Surgical Staff of the Royal Prince Alfred Hospital, to Drs. Keith Inglis and Cyril Shearman of the Sydney Hospital, also to Dr. F. S. Hansman, Dr. R. A. Money, Messrs. Dawes, Barfield and Louis Schaefer for valuable assistance.

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ABERRANT THYROID TISSUE.

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Embryology and Life-History of the Thyreoid.

The orthodox view of the embryology of the thyroid may be summarized from J. T. Wilson's description in Cunningham's "Anatomy."⁽¹⁾ The thyroid takes origin in a hollow median down-growth from the entoderm of the floor of the pharynx which has been recognized as early as in embryos of less than two millimetres (see Figure I.) As the bud grows, its end expands, whilst the stalk narrows to form the thyreo-glossal duct which becomes obliterated normally quite early, leaving only a vestige at the upper end in the form of the *foramen cæcum* of the tongue. The thyreoid *Anlage* continues to migrate caudalwards, becomes bilobed, loses its lumen and in a nine millimetre embryo is a transverse bar composed of anastomosing cell columns in the meshes of a vascular mesenchyme. Lumina appear in groups of cells in the columns in twenty-four millimetre embryos forming the "primary follicles" and by budding off from these "secondary follicles" are said to be formed, beginning in fifty-five millimetre embryos. Differentiation is practically complete, therefore, at a very early period and in fact the thyroid is almost the first organ to become distinct in the human embryo. Eugenia Cooper⁽²⁾ describes the primary follicles as tubules from which branching tubules are given off, and even later in fetal life when vesicles, follicles, alveoli or acini (all these terms are used synonymously).

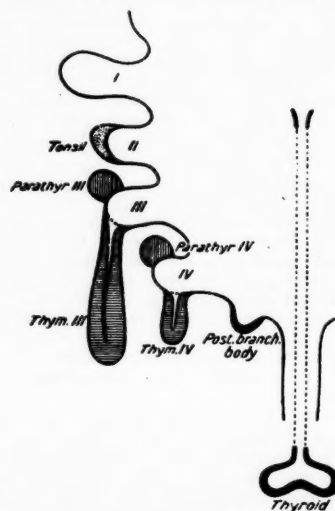


FIGURE I.

Diagram to illustrate the development of the thyroid, thymus et cetera from Sharpey-Schafer, "The Endocrine Organs," 1924.

ly) are formed in the peripheral parts of the lobes, the central parts still consist of branching tubules and solid cell groups. Sharpey-Schafer⁽³⁾ states that colloid does not appear until after birth, but Cooper states definitely that colloid is present in some of the larger peripheral vesicles in the seventh month, more abundant at the eighth month and that at term most of the vesicles contain colloid.

Whilst a purely median origin for the thyroid is certainly at the present time the orthodox teaching in British schools, it was formerly held that the pyramidal lobe and isthmus were so derived, but that the lateral lobes were in part or wholly developed from lateral pharyngeal pouches. This view is still stated in some books and the fourth and fifth pharyngeal pouches are both mentioned. For example, Jordan⁽⁴⁾ states that "the lateral anlagen grow down from the ventral border of the fourth pharyngeal pouches; they form the lateral lobes of the gland." There seems to be little support for this origin in man, though Zuckerkandl⁽⁵⁾ believed it to hold in the rat (see Figure II). It does appear, however, that the ultimobranchial bodies, derivatives of the fifth pharyngeal pouches, are merged in the embryonic thyroid and it is a question whether the epithelial cells which they contribute, ultimately disappear altogether or take a part in the formation of the gland. Grosser⁽⁶⁾ examined this question in man and concluded that there was no lateral Anlage, that the ultimobranchial bodies became merged in the thyroid and disappeared (see Figure

III). J. T. Wilson⁽¹⁾ states that it is possible that the fate of the ultimobranchial bodies is a variable one. Getsowa⁽⁷⁾ claims to have identified in the normal thyroid residues of aberrant parathyroid tissue and also of the normally disintegrating ultimobranchial bodies and some rare tumours of the

thyroid are said to develop from these heterotopic and persistent structures. It is interesting also to note that in cases of unilateral thyroid aplasia, Erdheim⁽⁸⁾ found normal parathyroids and a cyst with tubular glands representing the atrophic lateral thyroid. But it seems more in accord with other work to regard this structure as produced by the ultimobranchial body.

To return to the histology of the gland at different periods of life, it is interesting to note that at practically all ages intervesicular groups of thyroid cells were found by Cooper. Now, though Sharpey-Schafer states that the identity of these cells has not been established, yet it does seem certain that they are epithelial cells and that they vary in number in different conditions of the gland and that it is largely from these cells that the enormously increased numbers of alveoli or vesicles are developed in hyperplasias. They are not "cell rests" but a reserve of fully differentiated thyroid cells. During child-

hood Cooper found a great increase in the intervesicular cells with minute vesicles forming amongst them, whilst the larger vesicles are irregular in shape and size and show piling and contain much vacuolated colloid. This hyperactivity becomes accentuated in late childhood and adolescence when

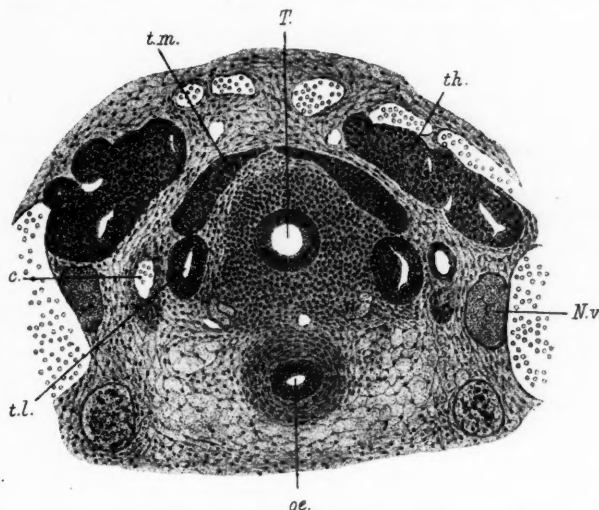


FIGURE II.
Section of neck of rat embryo. From E. Zuckerkandl, *Anatomische Hefte*, 1903.
th. = thymus, T. = trachea, t.m. = mesial thyroid Anlage, t.l. = lateral thyroid Anlage, c.s. = carotid sinus, N.v. = vagus nerve.

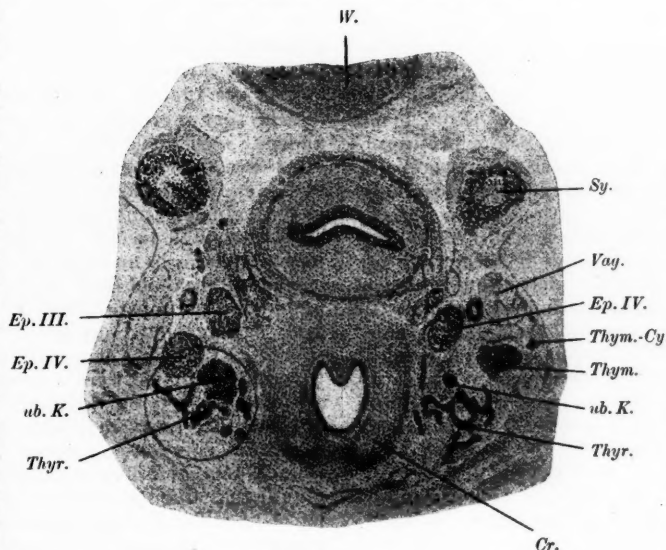


FIGURE III.
Section of neck of human embryo, after Otto Grosser.

the epithelium may be in places columnar and colloid may be largely absent, in fact the picture may simulate one type of exophthalmic goitre. By the twentieth year, according to Cooper, this activity has abated, so that the histology is that conventionally depicted for the colloid gland and this picture was found as a rule throughout middle life in normal glands, though in a pregnant woman of thirty-seven the gland showed hyperactivity. In old age the connective tissue is increased, but Cooper denies that it is normally atrophic in old age or in any way comparable with the picture in myxœdema. In glands examined by us, death being due to causes other than thyroid disease, we found the weights very variable; for example, in the age period 31 to 40, twenty-four grammes and forty-eight grammes, in the age period 41 to 50, nineteen, twelve, thirty, thirty, forty-seven and eighteen grammes (average twenty-six grammes), in the age period 51 to 60, sixteen, twenty-one and thirty-five grammes (average twenty-four grammes), in the age period 61 to 70, fourteen, thirty and thirty-one grammes (average twenty-five grammes) and in one subject of 78 years, nineteen grammes. The average of these weights agrees very closely with the figure usually given for the normal adult gland on the other side of the world, namely twenty-four grammes. We found colloid in some of the vesicles in the gland at birth in agreement with Eugenia Cooper.

Aberrant and Accessory Thyroid Tissue and their Tumours.

It seems to us that the last word has not been said on the subject of aberrant and accessory thyroid tissue and its tumours. We shall not dwell upon lingual thyroids, thyro-glossal duct vestiges or cysts or accessory thyroids about the hyoid bone, all median structures easy of interpretation. Further down in the neck and in the mediastinum in relation to the thymus accessory thyroids have been described and also in relation to the lateral lobes, in the wall of the trachea and elsewhere and an origin from the median *Anlage* is acceptable for these. It is worthy of mention that the occurrence of myxœdema after excision of lingual thyroids in a number of cases is evidence against the development of the lateral lobes from the pharyngeal pouches. The section of this subject in which we have taken particular interest, and which is more difficult to explain, is the occurrence of accessory or aberrant thyroid tissue in the sides of neck and not closely related to the thyroid lobes or attached to it only by a pedicle. It is not easy to obtain precise information on this subject. McFarland⁽⁹⁾ writes that:

The occasional occurrence of supernumerary thyroids in the sides of the neck makes it probable that the older view of the embryo-genesis of the gland is correct, and that some of its substance is derived from the branchial grooves. How frequent aberrant collections of thyroid substance really are, is difficult to say, as they commonly remain undiscovered unless pathological change affects them.

He states that twenty cases of lateral cervical thyroid collections have been reported, but whether

these were pathological or not he does not say and the references to these cases have not been accessible. He does go on to say, however, that they may develop into goitres or may be the source of malignant tumours, so that evidently some of these aberrant glands were pathological. We are in the fortunate position of being able to bring before you four cases of lateral cervical thyroid tissue, all of them pathological, and in three of them no connexion with the thyroid gland proper could be established.

As we have already stated, we have not been able to find or obtain access to helpful comparable reports, though it does not seem likely that they are excessively rare. Ewing⁽¹⁰⁾ quotes a case reported by Becker in which there was a supraclavicular tumour, thought to be a metastasis from the normal thyroid, but which he interpreted as more probably an aberrant thyroid. Crotti⁽¹¹⁾ states that though metastasizing colloid goitre usually infects bones by way of the blood vessels, in rarer cases it may infect the cervical, mediastinal and bronchial lymph glands by way of the lymphatics. But these metastases are said to consist of normal thyroid tissue. Again in discussing metastases from papillary tumours of the thyroid, the same author states that "lymphoid masses may be found, many of them possessing a distinct germinal centre." These papillary tumours make metastases especially in the lymph glands and the metastases have the same histological picture as the primary tumour. Furthermore, Ewing alludes to the finding by Langhans of numerous lymph-follicles in the tissue surrounding papillary tumours and we are told that three other workers have described cases of papillary cystic tumours in the neck which were traced to accessory thyroids. Taking these various findings and our own cases into perspective and endeavouring to see the wood as well as the trees, is there any satisfactory solution? It would be easier to avoid any conclusions and await other data, but we shall be rash enough to offer a solution. In three of our patients there is no evidence of anything pathological in the thyroid itself, and two of these have been under observation for two or three years. We suggest that in them there are no metastases from the thyroid, that in very earliest embryonic life the thyroid columns were excessively migratory and established outlying nodules further away than the ordinary accessory thyroids of anatomical writers, came into close association with the cervical lymphatic system and lost connexion with the thyroid gland, that during adolescence or adult life one or more of these became adenomatous and increased greatly in size and, as is said to be common with papillary adenomata of the thyroid itself, when developing malignant properties they then metastasized in a local fashion in various cervical lymph glands. We invite discussion upon these cases and criticism of our solution. There is one interesting feature that we have not commented upon and that is the fact that in all of our cases the appearance of lateral cervical thyroid tumours was restricted to the one side. They never crossed over.

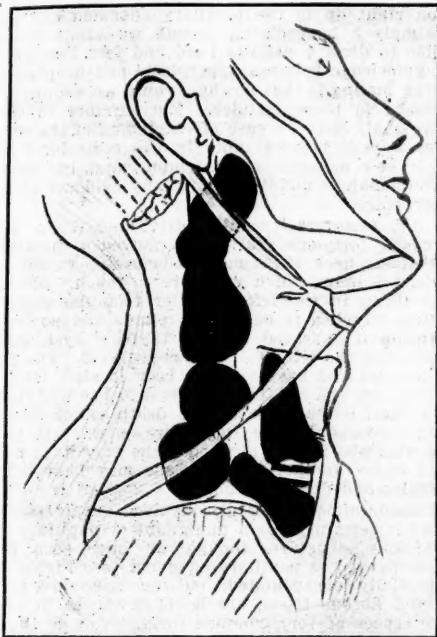


FIGURE IV.
Case I: Diagram showing thyroid and aberrant tissue, size exaggerated.

Case Reports.

CASE I (reference number E44).—R.B., a female, single, *etatis* twenty-five years (see Figure IV). Since the age of thirteen she has had lumps down the right side of the neck, enlarging and without pain or tenderness. The first lump came below the right ear. No toxic symptoms were noted and there was no anaemia. It was thought that there was a mass of enlarged and not discrete lymph glands underneath the sterno-mastoid and extending from behind the mandible to the suprasternal fossa. At operation the sterno-mastoid had to be cut away and a mass of what looked like lymph glands, connected by numerous veins to the internal jugular, was dissected away. Some of the lumps contained small cysts with dark material. None seemed to be connected with the thyroid gland, which was, moreover, not seen during the operation. The patient made a good recovery and has not suffered any recurrence in two and a half years nor developed obvious hypothyroidism.

Only two sections were cut. The first, depicted in Figures V and VI shows a definite lymph gland in which are colloid-containing cysts showing papillary processes, sometimes quite complex, lined by high cubical epithelium with vesicular nuclei. In the walls of the cysts are solid groups of epithelial cells and also out in the lymphoid tissue of the lymph gland, as if it were a metastasis of carcinoma. There are numerous curious, somewhat concentric bodies, not unlike *corpora amylacea* and staining very deeply, mostly in the centre of groups of thyroid cells, which we think may be calcific deposits in inspissated colloid. The section shows a small portion of one cyst wall.

Under ordinary circumstances one would certainly say that this is a metastasis of papillary adenoma (malignant) in a lymph gland.

The second section (see Figure VII) is of another lump which shows no lymph gland tissue (it may not be a complete section of the lump), but consists of cystic spaces containing very little colloid, but numerous complex papillary processes lined by columnar epithelium with vesicular nuclei. There are numerous acini in the larger papillary processes. Curiously enough, the colloid appears

to be in the stroma and not in the acini. Certainly the structure is that of a papillary adenoma of the thyroid; were it in the thyroid one would have to bear in mind the possibility of malignancy.

CASE II (reference number F.387).—Mrs. W., a female, *etatis* fifty years (see Figure VIII), was supposed to have had a carotid body tumour removed four years before admission. The glands were enlarged above the left clavicle for six months. Some of the glands were cystic and contained papillae, while others were dark and solid. They were embedded in fibrous tissue. Microscopically a typical one of these bodies was comprised of glandular tissue and partially surrounding it there was a layer of lymphoid tissue, containing germ centres either the remains of a lymph gland invaded by glandular tissue or *vice versa*, more probably the former, because the lymphoid structure is that of a lymph gland and because the glandular tissue does show neoplastic characters (see Figure IX). It consists of large alveoli containing colloid and numerous papillary processes project into some of the alveoli. The epithelium is cubical or columnar. These papillary processes give it the character of a papillary adenoma. The epithelium is regularly arranged and does not suggest malignancy.

Eight months later the patient returned with lumps high up in the neck. At operation a mass was found under the mastoid process near the lower border of the parotid. This was removed and was unfortunately thrown away by the nurse. But some tissue was also found around the carotid and a strip of this was removed, a portion of which is shown in Figure X. The tissue consists of a very small, somewhat fibrous, lymphatic gland and adjoining it dense fibrous tissue invaded by a growth consisting of colloid containing vesicles and intervesicular epithelial cells. The cells lining the vesicles are often flattened or low cubical, but also columnar and the intervesicular cells are of all shapes and sizes, cubical, polygonal, columnar and the nuclei are irregular in shape and size and stain deeply. The appearances strongly suggest a malignant transformation, as compared with the previous tissue, removed from the supra-clavicular region. We consider it to be an adeno-carcinoma of thyroid tissue, probably growing from a lymph gland.

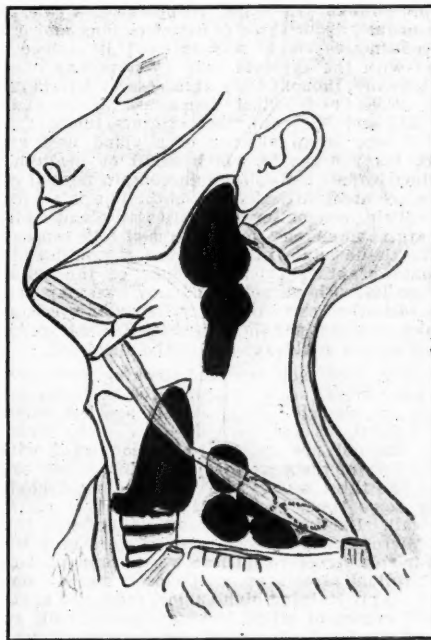


FIGURE VIII.
Case II: Diagram showing thyroid and aberrant tissue.

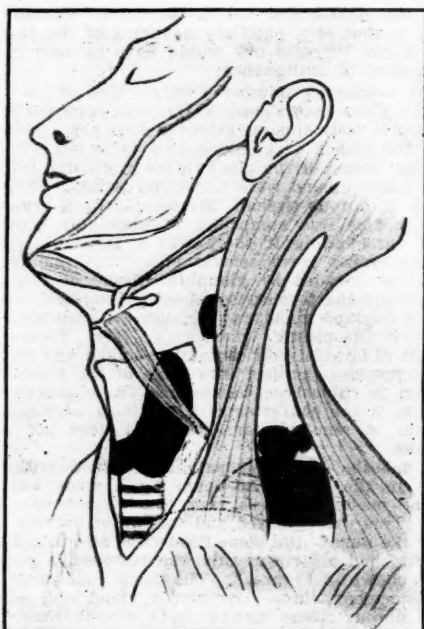


FIGURE XI.

Case III: Diagram showing thyroid and aberrant tissue.

CASE III (reference number F698).—K.B., a female, single, *ætatis* twenty-four years (see Figure XI). Her friends noticed a lump on the left side of the neck. It was not painful. It had been certainly present for three months. It was found to be a freely movable nodule, possibly in relation to the left lobe of the thyroid gland. There were no toxic symptoms. At operation a pale, amber-coloured nodule, about three centimetres long and one and a half centimetres thick, was excised; it seemed to be connected with the thyroid only by a pedicle, if at all. It was, therefore, thought to be an accessory lateral cervical thyroid. The histological characters are depicted in Figures XII and XIII and are certainly those of a new growth. There is an absence of a gland unit system; there are many areas in which small or medium sized alveoli, lined by flattened epithelium, contain normal colloid. But there are areas in which the epithelium is cubical and without colloid, resembling a hyperactive gland and again at the margins numerous small groups of cells separated by connective tissue and without lumina simulating alveolar carcinomata of other organs. Some of the cells have atypical nuclei with vacuoles and are irregular in shape and size. In other parts there are irregular cystic spaces, into which project papillary processes. Altogether its malignant nature could not be lightly dismissed.

Six months later she returned, looking perfectly well, but she had several other lumps in the posterior triangle above the left clavicle. They were tense but fluctuating and not painful. These were dissected away with some difficulty, but did not appear to be connected with the thyroid. Two of them were solid reddish-amber coloured nodules. The third was cystic. The cyst must have been there for some time, because it contained a partly calcareous wall. Bulging into it was papillomatous thyroid tissue. Microscopically these nodules were seen to have a very variable structure. There were areas consisting of quiescent colloid alveoli, areas of closely packed small alveoli with deeply staining high cubical cells, also areas with small solid groups of active looking thyroid cells as seen in some of the fetal adenomata and further all grades of papillary formation as in the two previous cases. There was little stroma, but the blood vessels were conspicuous, thin walled blood sinuses for the most part. We are of the

opinion that here we see all grades of adenomatous proliferation right up to the papillary adenoma and that it is not simply a hyperplasia, though we admit that it is impossible to draw a definite hard and fast line with our present knowledge between hyperplasia and neoplasia. An interesting finding is that nowhere could we see any lymph gland tissue in these nodules. Furthermore in another report we shall record a case of carcinoma of the thyroid and over a year later a lump in the posterior triangle, thought to be a metastasis in a lymph gland, but proved to be a carcinomatous nodule without any evidence of lymph gland structure.

CASE IV (reference number D175).—E.G., a female, single, *ætatis* forty-one years, first noticed a throbbing in the side of her neck, three months before operation. Later, she noticed a lump which was sore to touch. She had a cystic swelling in the left posterior triangle, moving on deglutition, attached to deeper structures and not to skin. At operation it appeared to be a thyroid cyst, attached by a pedicle to the left lobe; it was removed. The patient was discharged and has not since been located. It is now three years ago and a letter addressed to her was returned from the dead letter office, but no death under this name has been recorded by the Registrar-General. It is most probable that she is still alive, but she may have married and died under another name or she may have left New South Wales and died elsewhere.

The tumour almost certainly involved an accessory thyroid and it certainly has a malignant or papillary adenocarcinomatous structure, though we have seen similar structures figured as papillary adenoma (see Figure XIV). It is partially encapsulated, but on one side at least muscle and fibrous tissue are being invaded. It consists of cystic spaces of very complex form, owing to the ramifications of numerous papillary processes into the spaces. The processes often contain alveoli and both these and the cystic spaces contain colloid here and there. The epithelial cells are columnar or high cubical, the nuclei somewhat irregular in shape and size, but mostly oval and not showing mitotic figures. The connective tissue of the processes is delicate and scanty and may contain a few lymphocytes. The fibro-muscular tissue on one side is being invaded by small and large cell masses, the former somewhat scirrhous, the latter showing central degeneration, hæmorrhage, *et cetera*. Tumours that invade their capsule cannot be classified as benign.

CASE V (reference number C443).—E.D., a female, single, *ætatis* fourteen at the time of the first operation, had an enlargement in the right side of neck above the level of the thyroid; this was first noticed at the age of twelve and at the age of fourteen a lump appeared above the sternum. There was no pain. There was a firm swelling under the middle of the right sterno-mastoid, also above the sternum, both said to be attached to the thyroid. The skin of the hands was dry and coarse and the records show a diagnosis of cretinism. The operation notes were that a cystic tumour was shelled out, the size of a pigeon's egg, but it was not further examined. Four years later, she was readmitted with a history of an enlargement in the right carotid triangle for two years. At operation the tumour was found to be vascular and "an offset from the thyroid," and microscopical examination showed an adenoma of the thyroid. Fifteen months later she was readmitted with further lumps in the right side of the neck. She was anæmic-looking, was undergrown and showed signs of myxedema. Again there was a swelling, thought to be enlarged lymph glands, at the anterior border of the right sterno-mastoid. They were painless, fluctuating, not attached to the skin and did not appear to be discrete. At operation a mass of thyroid tissue containing several encapsulated tumours was removed (see Figure XV). They were multiple adenomata. Microscopical examination (see Figure XVI) reveals a good example of tubular structure with frequent branchings. The colloid is small in amount, but is seen in many tubules and alveoli. The blood vessels are thin-walled and hæmorrhages are numerous. The connective tissue is degenerate. In some areas the epithelial cells are high cubical and the appearance of functional activity in the tumour tissue is definitely given. The patient was put on thyroid extract and discharged; her subsequent history is not yet known.

Unfortunately, not all the specimens were examined, but our opinion was that they were adenomata in accessory thyroid tissue, associated in some way with juvenile myxoedema.

Acknowledgments.

We desire to acknowledge our indebtedness to Dr. H. R. G. Poate, Dr. Eric Fisher and Dr. T. M. Furber, of the surgical staff of the Royal Prince Alfred Hospital, Sydney, for permission to use their material and for their interest in our work.

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DR. A. B. PEARSON (Christchurch) said that he was very interested in Dr. Tebbutt's views on adenomata. He thought that the adenomatous masses were usually adenomatous nodules associated with functional disturbance. With regard to the peculiar connective tissue he had thought it was hyaline degeneration. The blood vessels were thicker structures like those found in new formed tissue and not in tumour formation.

DR. W. GILMOUR (Auckland) said that he had only had one case of a growth resembling true thyroid tissue found some distance from the thyroid. It had no connexion with the lymphatics. He had seen only one case of a malignant growth in a thyroid and this was a fibro-sarcoma.

DR. P. P. LYNCH (Dunedin) said that during the year he had found two cases similar to those described by Dr. Tebbutt. He thought they were benign metastatic adenomata. One was in a child of fourteen years who had a gland which was thought to be tuberculous removed from her neck. On examination the histology was similar to that of the tumours shown by Dr. Tebbutt. He thought it was a metastatic growth from an adeno-carcinoma. At the periphery there were definite groups of cells in the sinuses of the gland. There was some enlargement of the thyroid and this was removed. On examination the structure was found to be similar to that of the gland removed. Other glands were also found at a later stage. The other case was in a woman of thirty-five years who two years before had a mass of glands removed from the neck, but these were not examined histologically. She had masses of gland removed every six or eight months. He had examined some of these and they resembled those of the previous patient. At the first operation an encapsulated tumour had been removed from the thyroid.

PROFESSOR A. M. DRENNAN (Dunedin) said that he was interested in the matter of thyroid tumours. He regarded the nodule as hypertrophic changes, the result of exhaustion or damage to the gland substance. He admitted, however, that there was no reason why a tumour should

not occur in the thyroid just as tumours occurred in the breast. A great number of thyroid enlargements were seen in New Zealand and he thought that many of these nodules were an effort to compensate for damage to the gland. Chemical examination of thyroids had been carried out in New Zealand and he would like to know if Dr. Tebbutt had done any similar work. He had examined specimens of carcinoma of the thyroid and these were free from iodine. It was very difficult to know when one had a real tumour or not. He would like to ask Dr. Tebbutt if in association with thyroid tumour there was much pathological change in the rest of the gland.

PROFESSOR J. B. CLELAND (Adelaide) said that he had not seen many definite adenomata in the thyroid. With regard to the lateral nodules found in the neck he had performed an interesting *post mortem* examination in which he found large nodules in the region of the clavicle. There had been no clinical note of any enlarged glands in the neck. The patient had also suffered from extensive carcinoma of the stomach. On section the glands were found to be quite unrelated to the gastric carcinoma, but resembled thyroid tissue. He had seen another tumour in which there was a nodule of thyroid tissue in the lower jaw and yet another in the middle of the tongue. Dr. Bull had seen a growth which had been removed from the femur, and this proved to be a secondary deposit from a malignant growth of the thyroid.

DR. A. H. Tebbutt replied that with regard to Dr. Pearson's remarks about the connective tissue changes being of a hyaline nature, he was not satisfied that this was the case, but was not prepared to state what kind of change it was. He was going to investigate this matter.

In reply to Dr. Lynch and Dr. Gilmour he said that he had not dealt with accessory tumours in the mid-line of the neck nor with accessory tissue in lateral areas. He dealt only with tumours far out in the neck. In his cases there was no evidence on palpation of thyroid disturbance. He had to confine himself to embryological data. In reply to Professor Drennan he said that he had paid no attention to the chemical side. Marine had shown that in tumours of the thyroid there was reduced iodine content proportional to the differentiation of the tumour and that the response to iodine therapy was also proportional to the differentiation of the tumour. The rest of the gland was not usually removed along with the tumour so that he could not say anything regarding the pathological changes in it. He thought that the thyroid atrophied when there was tumour growth. In the early stages of the growth of adenoma proliferation was the chief change. When proliferation stopped, thyroxin might be formed in the tumour. It was very difficult to distinguish between adeno-carcinoma and papillary adenoma of the thyroid. He thought, however, that he had definitely shown that in adult adenomata the tendency was towards capillary formation.

SECTION VI.—OPHTHALMOLOGY.

THE TEACHING OF OPHTHALMOLOGY TO MEDICAL STUDENTS.

By LEONARD J. C. MITCHELL, M.D., B.S. (Melbourne),
Honorary Ophthalmologist to the Melbourne Hospital.

THE teaching of the rudiments of ophthalmology to senior medical students presents the problem common to any special subject which is not a subject of a professional examination in the medical course. Much depends on the teacher as to whether it is successful or not. The groups should be small, the number of students attending at one time should not exceed six or eight.

The two outstanding difficulties are first to obtain the interest of the student and to hold it throughout and second to present the various cases of everyday

occurrence in a simple fashion, always avoiding the superior attitude or giving the impression that as the time is short, it is useless trying to do anything thoroughly.

The interest of the student is best secured by first of all outlining the routine examination of an eye from beginning to end and then allowing students to examine various aspects of cases for themselves, afterwards checking the findings with them.

Next a set clinical talk on some ordinary condition should be given each day. In the six weeks of attendance at an eye clinic the teacher has no time to waste and should outline a programme to be carried through with each group.

Punctuality in starting and if possible in finishing should be insisted on, for this means that the students at once see that they are expected and further they know when they will be finished with. Nothing is more disheartening to the student than to feel that he is not welcome or that he wants to leave the clinic and yet something useful might turn up if he goes off too soon. The work should be arranged so that the cases of interest are put aside by the assistants and are then dealt with as required but always within the time limit. The assistants should, when suitable, be given a definite part in the teaching.

Before coming to details of subjects to be touched on, the teacher must realize that it is impossible to deal with the subject of refraction if any time at all is to be devoted to the treatment of conditions to be met with in general practice. Beyond showing the students what is meant by the fundus reflex and the so-called "shadow," this branch of the work is better left alone. It will be agreed that facility in the use of the ophthalmoscope is to be aimed at and to that end time spent in the explanation of the application of both direct and indirect methods with the ordinary Morton ophthalmoscope, followed by the individual helping of each student to see the fundus and making sure he does see it, is perhaps the best way to employ the bulk of the time available at the first couple of attendances.

The students should be encouraged to see as many normal fundi as possible and this prepares the way for the showing of well defined examples of the commoner pathological fundi as arterio-sclerosis, albuminuric retinitis, papilloedema, choroiditis, retinal detachment and so on, but the teacher's chief aim should be to lay stress on the appearance of the normal fundus.

Whether a luminous ophthalmoscope be used for teaching these students or not is a moot point; certainly such an instrument is of great use in demonstrating a given case, provided it is fitted with a good reflector prism, for then its use does not call for any special skill with a patient's eye under the influence of a mydriatic. However, the high cost of these instruments and the short life of a battery, along with the very limited scope of usefulness (at its present state of development) beyond that of a direct method would seem to point to the advisability of insisting on the student learning

the many uses to which a Morton or similar non-luminous ophthalmoscope can be put.

The showing of a good fundus atlas has distinct advantages provided the pathological conditions are always compared with the normal picture. At the risk of being tedious, one would stress the several little points in routine examination to which must be brought home to a student in no uncertain manner.

The salient points in the history apart from the general history, age of patient, the question of difficulty or headaches at near or at distant work, the inequality of the two eyes, the presence of rainbows, what that patient means by "weak eyes" and so on need to be emphasized and if glasses are worn, inquiry should be made as to whether they were ordered by an optician or by an oculist.

In taking the distant vision the student must be taught how to hold a piece of cardboard five by seven and a half centimetres (two by three inches) before the other eye, that is to say with firm contact on the side of the bridge of the nose and on no account to allow the patient to use his own hand; nor should the examiner use his to cover the eye not being tested. Further, the importance of always taking the vision of the right eye first should be pointed out.

Coming to the inspection of the eye and its appendages, the importance of examining in good daylight must be insisted upon and the use of the hand lens for concentrating both daylight and artificial light must be demonstrated. Particular care should be taken in showing how to follow the routine in this inspection so that nothing be missed, lids, lachrymal sac, cornea, iris, pupil, tension and so on. The use of the +20 lens or the corneal loupe (the latter especially) is worth quite a little time in demonstrating. In the matter of instilling drops into the eyes it is well to insist that the glass part of the dropper be held between the second and third fingers, leaving the thumb and index finger to control the bulb, and then to show how to touch the margin of the lower lid with the drop and float the drop in, the patient having first been told to look up and to keep looking up and down both the patient's lower lids having been drawn simultaneously with the thumb and index finger of the operator's other hand. The students should also be warned against allowing the fluid in the dropper to run back into the rubber bulb. The fact that such minute traces of drugs like atropine and eserine cause a physiological response should form a useful peg to hang the plea for scrupulous cleanliness and care in their use.

For general practice the use of ophthalmic lamellæ such as those put up in aseptic ophthalmic pocket cases should be pointed out. This is the most economical way to carry these drugs. A list of half a dozen most desirable lamellæ should be given to the student, also give a few simple prescriptions for drops, lotions and ointments. Very clear advice as to the use and abuse of atropine should be given.

A demonstration of how to apply ointment to an eye should not be omitted, for a careless or clumsy

use of ointment or drops will make an enemy of a little child.

The adroit eversion of an upper lid with fingers alone should be taught; the student should stand behind the seated patient. At such a time in similar manner he should be shown how to swab the everted lid and the upper fornix with a wool swab on a glass rod or a match. Fluorescein as a stain for corneal abrasions or to outline foreign bodies in the cornea makes its own appeal once it is demonstrated.

Foreign bodies in the cornea, their location and their removal by a swab or needle or by anything but an eye spud can be well illustrated on a black-board and in like manner corneal vessels and *keratitis punctata* should be drawn first before expecting a student to know what he is looking for.

As to perforating injuries it is best to insist that they be covered with an aseptic dressing, a drop of 1% atropine instilled and the patient sent to hospital at once and not interfered with elsewhere. With the limited time at one's disposal it is necessary to make a careful selection of conditions for the daily clinic and it will be allowed that none of the following should be omitted, muco-purulent conjunctivitis, chronic conjunctivitis, trachoma, blepharitis, squint, interstitial keratitis, corneal ulceration, iritis, glaucoma and cataract, while choroiditis, retinitis and so on should be taken as they arise in the course of the work.

The tabulating of the signs and symptoms of acute conjunctivitis, iritis and acute glaucoma will help the practitioner when confronted with a "red eye."

Students should see some eye operations especially if the surgical procedures are first illustrated step by step by diagram and then explained again after the operation is completed. He will acquire a profound respect for cocaine and the value of preliminary injections of a small dose of morphine as a method of calming a patient on the operating table. He will be disappointed at the lack of spectacular surgery, but if he learns only the value of cocaine and a wholesome respect for an eye it will be a definite gain.

For the degree of doctor of medicine the graduate should be shown a few clinical cases of ordinary conditions, know how to take a field of vision, be able to pick out the commoner fundus conditions, quite as much with the object of being able to describe what he sees, as to make a diagnosis. In his case the written question is covered in a book like Foster Moore's "Medical Ophthalmology" (which is the best book on the subject), together with any outstanding work on this subject in the current literature.

DR. A. M. MORGAN (Adelaide) said that after seventeen years' experience in clinical teaching his aim was to teach students to see simple things. The university authorities were inclined to eliminate the examination in ophthalmology which he thought was a great mistake. He taught students to recognize simple conditions of the eye, so that if they happened to be practising in country districts they would be able to distinguish between conjunctivitis, iritis and glaucoma and send their patients

early to the specialist. He did not recommend the teaching of refraction, but thought that they ought to be able to recognize hypermetropia, astigmatism and myopia. He thought it was useless to teach the operation of cataract. He taught removal of foreign bodies, the operation for chalazion and such simple operations. He insisted that every student should see the fundus properly. He made each one draw a picture of the disc and vessels of the retina as he saw it. He emphasized the point that when they went out to practice, they should send patients with squint to the specialist at an early stage and not wait to see if it would clear up without treatment.

SIR JAMES BARRETT (Melbourne) said that when the curriculum for medical teaching was being discussed and the course extended to six years, he had suggested that all general subjects should be taught in the first five years and the sixth year should be devoted to specialists' subjects and treated as post-graduate work. In Melbourne in conjunction with the Professor of Physiology he had taught students the use of the ophthalmoscope, laryngoscope and the otoscope while they were studying physiology. Refraction work was also taught in an elementary way. This training he found was successful as a student was able to proceed to the out-patient department for his clinical teaching knowing how to use the ophthalmoscope. He thought that the teaching of ophthalmology was a very important subject in medicine and he congratulated Dr. Morgan on having an endowed chair of ophthalmology in the Adelaide University.

DR. A. J. HALL (Dunedin) said that lectures should always be followed by practical demonstrations of the subjects discussed. He said that in Otago University the Professor of Physiology tried to render every student familiar with the use of the ophthalmoscope. He did not believe in teaching students refraction work or operations. He thought that it was important for the student to be able to recognize the normal fundus. Afterwards when he became a house physician or surgeon he could learn to recognize diseased conditions of the fundus. He urged the teaching of general diseases, such as cardiac and renal diseases, diseases of the accessory sinuses, in their connexion with changes in the eye. He thought it was necessary that a student should be as familiar with the ophthalmoscope as with his stethoscope.

DR. L. S. TALBOT (Timaru) said that he thought it would be a good thing to let students examine the fundus with the electrical ophthalmoscope first and then to proceed to the use of the direct and indirect methods with the ordinary ophthalmoscope.

DR. H. F. SHORNEY (Adelaide) described his methods of teaching at the Adelaide University. It was a great mistake to do away with examinations. He thought that students soon gained a knowledge of refraction work. He thought that an important point was the picking up of the red reflex. All his students had an electrical ophthalmoscope, but he preferred the ordinary one to enable students to pick up the red reflex.

DR. G. E. O. FENWICK (Auckland) thought that it was no good teaching refraction. Students should be taught the difference between atropine and homatropine.

DR. W. E. CARSWELL (Dunedin), DR. A. G. TALBOT (Auckland), DR. E. L. MARCHANT (Wellington), DR. W. M. MACDONALD (Dunedin) agreed generally with the remarks of previous speakers, especially the idea of Sir James Barrett that students should learn the use of the ophthalmoscope while doing their physiology course.

SECTION X.—NAVAL AND MILITARY MEDICINE AND SURGERY.

SOME MEDICAL ASPECTS OF RECRUITING FOR WAR.

By LIEUTENANT-COLONEL A. D. CARBERY, C.B.E., V.D.,
New Zealand Medical Corps Reserve.

The ideal concept of modern warfare is a struggle for supremacy between nations fully mobilized, exerting the maximum cooperative pressure,

physical, economic and political, by means of a perfected organization for war.

In the community at war all should be recruited and in proportion to the discrimination which allots to each individual his task according to his capacity, whether as a fighter, as an auxiliary, as a worker in the factory, a producer in the homeland or in occupations of an administrative character, so will success attend the warlike operations.

In preparing for war the first essential would be a peace time organization for war which comprised the mobilization of all available sources of human energy, both male and female, and would include some form of national medical examination, considerations which, however interesting, carry us far beyond the scope of our present deliberation which is the medical examination of the fighting troops.

Adequate medical examination and classification of the arm-bearing population is of primary importance in the economic conduct of war and we have much to learn from the errors of the past.

During the Great War New Zealand recruited 124,211 men, of which number 92,860 embarked for service overseas. The numbers recruited formed 52% of the male population for nineteen to forty-five years of age.

By the end of 1917 we had dispatched overseas 88,221 soldiers. Of these 11,487 had been killed or had died from various causes and 14,141 had returned to New Zealand. Of the returned men 1,167 had been found unfit on arrival at overseas bases and had not reached a zone of active operations, while of the category men at this time in England or with the New Zealand Expeditionary Forces in France or the Near East, whose numbers probably exceeded 3,000, very many were the subjects of prewar disabilities and undoubtedly should not have been recruited.

It is agreed that both France and England over recruited during the first years of the war, as the normal high rate of martial inefficiency in the arm-bearing population was not fully appreciated. Economic loss of serious consequence resulted from over recruiting.

In New Zealand, as elsewhere, the unfit males by a process of trial and error had adjusted themselves to their economic environment in limited and sheltered occupations suited to their capacity. Serious economic loss was incurred by uprooting this type of man from his employment, drafting him overseas at great expense only to have him returned as unfit, technically pensionable, and for a time at least out of employment; added to which there was the degradation of efficiency in the man who no doubt had suffered in one way or another as the result of his limited service and found it difficult to readjust himself to altered conditions of employment.

The expansion of the main body in 1916 to the dimensions of a complete infantry division and a mounted brigade necessitated an increased rate of recruiting in New Zealand. The results of the medical examinations in 1914 and 1915 were deemed

by public opinion to be most unsatisfactory, inasmuch as the number of rejections amongst the volunteers averaged 25%. Ill informed criticism and accusations appearing in the public press did much to shake confidence in the validity of the examinations. Attempts were made to bring pressure to bear on the examiners to relax the standards of physical fitness in order that recruitment of volunteers should not be discouraged. A special advisory committee of civilian doctors set up at this time found that only 2% of the recruits entering camp after local examination were unfit for service. But having in view the fact that the sixth reinforcement arriving in Lemnos in October, 1915, when classified there presented a moderate percentage of unfit by prewar conditions, the 27% of rejections in New Zealand was clearly an overgenerous assessment. Our people had not yet realized the full extent of physical unfitness for war normally present in the male population; they were to be fully enlightened and disillusioned later on by the result of the ballots.

In the very efficient prewar German Army recruited by conscription the usual proportion of rejections from the annual drafts was about 55%. It is doubtful if in modern warfare whether even 40% of the arm-bearing population of civilized countries could be classed as fit to bear the added stresses of active service without disproportionate loss.

In New Zealand the reserve constituted by the *Military Service Act* of 1916 comprised two divisions of which the first included men of military age from twenty to forty-six years who were without dependants. The first division numbered 82,974 men at the time when the first ballot was held at the end of 1916, but the number of reservists actually called up in 1917 was only 76,567. The division was now exhausted, as many men of the division had already enlisted voluntarily. By voluntary enlistment alone New Zealand succeeded in recruiting 75,000 men.

From July 1, 1917, until the exhaustion of the first division 30,404 men were medically examined, of whom 58.6% were rejected. General concern was expressed at the low rate of acceptability in the drafts, but the proportion of low category men amongst the drafts from the first division is in part explained by the fact that this class of the male population had already contributed many of its fittest men by voluntary enlistment.

From the commencement of the ballot in November, 1916, to the conclusion in November, 1918, the total number of recruits examined was 135,282, the number rejected was 77,900, the quota accepted for training 57,382. The percentage of rejections was 57.6%. The accepted formed 42.4% of the whole.

There is much evidence to prove that even 42% was too high an estimate of fitness for war. The records of the Pensions Department indicate only too clearly that a relatively large proportion of men now drawing pensions suffered from prewar

disabilities which should have been sufficiently indicated by physical measurements and a more careful examination at the time of recruiting. The disease tendencies of these men would in all probability have determined disability even in civilian life apart from the stress of war; yet because they were accepted for service and pronounced, often on very doubtful evidence, to be fit men on enlistment the State must now grant aggravation because the pensionable disabilities were demonstrated during service.

A review of a very large number of attestation papers reveals the serious neglect of examiners to reject men who were much below the standards prescribed for height, weight and chest measurement or to recognize disabilities which should have been detected. Even the physical measurements recorded in many instances are proved to have been erroneous; deformities were glossed, gross defects of hearing or vision were not noted and in the worst instances men suffering from active pulmonary tuberculosis were accepted as fit for service.

One example is known of a man who escaped from a sanatorium and was enlisted and passed fit "A" within a day or so of his escape, and was not detected until a serious hæmoptysis a few weeks after enlistment and his recognition in camp by one of the medical officers of the sanatorium from which he had run away, revealed the egregious blunder made by the examining officer.

I have analysed the completed records of one hundred men who were enlisted as fit "A," and who died of pulmonary tuberculosis in New Zealand after service. The sample is not selected, but includes only male subjects of European descent recruited in various years from 1914 to 1918. In all cases the cause of death is verified; one reason for selecting those who died of tuberculosis, was that this cause of death is by far the most frequent in our pensioners. Out of 12,368 Great War pensioners in this Dominion no less than 10.73% are at present in receipt of grant on account of lung tuberculosis. The report of the Imperial Ministry of Pensions for 1925 shows that 9% of Imperial pensioners are suffering from chest complaints, including tuberculosis, whereas in New Zealand we had at the end of last year no less than 17.7% of pensioners by diseases of the respiratory organs of which more than one half were tuberculous. Apart from wounds tuberculosis is the commonest cause of pensioning.

Another reason for analysing these records was the assumption that the physical measurements

recorded on enlistment would afford some indication of diathesis.

Although the sample is small, representing only one-third of the total deaths by tuberculosis in New Zealand of war pensioners or ex-soldiers, yet the facts revealed seem to indicate that very many of these men should have been rejected on enlistment.

In the series under consideration the physical measurements of the recruits recorded on the attestation papers show that 80% were above the average in height, nearly one half were below the average weight and 36% were below the prescribed minimum in chest measurements, while 54% were below the standards both in weight and chest measurement in proportion to height and age. The group age is about twenty-five years; the recruits tend to be tallish youths, mostly light weights. Youth, tallness, low weight and deficient chest girth are the typical characteristics.

The configuration of this group type with a tuberculous diathesis is emphasized by comparison with a second series of unselected deaths in one hundred pensioners who died from various causes other than tuberculosis. In this series the average age is about thirty years; 38% were below the average in height, but only 30% below the average weight. It was found that 70% had normal chest measurements, many were deep chested men, on the whole a better type physically than the tuberculous, only 33% were below the standards for chest measurement and weight proportionate to height and age.

But in the combined group of two hundred dead pensioners 43.5% of the recruits were definitely below the standards of physical measurement prescribed. Many gave a history of prewar accident or disease often a precursor of the post-war fatality. Nearly one half of the tuberculous series gave a history of pre-enlistment disease, general infections, chest troubles. In the light of our present knowledge at least one half should have been rejected on enlistment. But one must make allowances for the hurried nature of the examinations, the lack of experience of the examiners and the prevailing enthusiasm to join the colours.

The work of George Draper in the Constitution Clinic of the Presbyterian Hospital, New York, shows that there is a relationship between anthropometric measurements and disease tendencies, that sufferers from certain forms of constitutional disease conform to distinctive prototypes of bodily configuration. This is true of cholelithiasis, peptic ulcer, the major anæmias, hyperpiesia and other

TABLE I.—ANALYSIS OF PHYSICAL MEASUREMENTS ON ENLISTMENT OF TWO HUNDRED WAR PENSIONERS WHO DIED IN NEW ZEALAND.

Cause of Death.	Average age on Enlistment. Years.	Percentage Below Average in Height.	Percentage Below Average in Weight.	Percentage Below Average in Chest Measurement.	Percentage Below Standard for Height and Age in Weight and Chest Measurement.
Pulmonary Tuberculosis	25	20	49	36	54
Other Diseases	30	38	30	29	33

disorders. Can it be doubted that the physical measurements of recruits are of first rate import as an index of physical capacity or disease tendency?

In the whole series of two hundred recruitments 43.5% were below the standards of weight and chest measurements in relation to height and age.

From our brief analysis of these hundred dead tuberculous soldiers it emerges that recruits whose measurements fall below the normal, more especially in weight, should not be accepted as fit unless they show a very decided improvement under graduated training.

Coming now to the consideration of disabilities present at the time of recruitment and most frequently overlooked by examiners I would instance first chronic suppurative middle ear disease, a disease usually originating in childhood, which is the most frequent cause of invaliding of recently joined recruits in the British Army.

In the Surgeon-General's report of 1923 it is shown that no less than 4.82 per thousand recruits previously found fit were invalidated out of the army by chronic *otitis media* during the first few months of training. In the last report of our Pensions Department it is noted that over 29 per thousand of the total existing Great War pensions were granted on account of auditory disease and it is very probable that many of these pensioners would have been rejected for ear trouble had they been adequately examined on attestation, as many had a prewar *otitis* which ran its usual course unaffected by any aggravation due to war service. The Royal Army Medical Corps Regulations of 1923 now provide a Brunton's auroscope as part of the equipment of the medical inspection room of a recruiting office and examiners are enjoined to inspect the ear drums of all recruits. Similar regulations no doubt will be in force in the Dominion.

Another disability in recruits of graver consequence is latent syphilis. It is stated that some 12% of the normal civilian population in European countries are infected with syphilis and in the hundred deaths by other causes already referred to there were ten who died from proved visceral or nervous syphilis. Some 17% had a known record of venereal infection and quite a number showed entries in the case sheets suggestive of syphilis. There was reason to suspect syphilis as a contributing cause of death in 24%. The sinister relationship of syphilis to cancer was also partly indicated.

During the year 1924 Willcocks at the Neurological Section of the Randwick Hospital found by routine examination 10% of positive complement fixation in 325 men tested who showed no gross sequelæ of syphilis. There were two tell-tale symptoms fairly constant, pallor and loss of weight. There is a grey pallor in syphilitics which, although frequently observed by pensions examiners and noted by them in their reports, to the trained observer is convincing. This pallor coupled with a complaint of persistent headache and a fixed pupil means advanced syphilitic disease and is nearly

always associated with cerebro-spinal fluid complement fixation.

The inspection of recruits should in every case include a routine examination for latent syphilis. The superficial glandular system should be searched more especially the postnuchal, supraclavicular and epitrochlear glands. There may be a scar on the genitals, not necessarily penile; if there has been treatment by "Novarsenobillon" the cicatrices of punctures will be found in the antecubital fossæ; the oro-pharynx and the tongue should not be neglected. By such an examination few cases of latent syphilis escape detection.

The fact that syphilitics are pensionable if the disease existed on enlistment and there is evidence of aggravation, which applies to cerebro-spinal syphilis, makes that type of recruit a very doubtful risk; nothing short of a full and intensive course of treatment with evidence that the cerebro-spinal fluid does not yield a complement fixation reaction should make them acceptable for war service.

In the attestation papers used during the Great War there was no inquiry as to the condition of the nervous system, a serious omission. At the present moment over 550 of our Great War pensioners are sufferers from some form of disease of the nervous system.

The proportion of pensioners of the Imperial Ministry suffering from disease of the nervous system is 6.9%. In New Zealand ex-soldiers the proportion is 4.8%; 4.47% of pensioners are suffering from war neuroses.

A rapid examination of the central nervous system is unquestionably necessary, but something more is wanted. The psychology of the recruit should be investigated at least superficially. If there is any system of the human organism which the horrors of modern warfare are calculated to affect it is the psychic system. Tachycardia, tremors, sweating, excitement, volubility, precipitancy in obeying orders, stammering, flushing or other signs indicative of nervous tension should be noted by the examiner.

Faulty posture is of considerable importance; the persistence of the infantile stance alone should postpone acceptance. Scoliosis and asymmetry, especially facial asymmetry, are accusing signs and should not be disregarded.

In most psychasthenics facial asymmetry is present and in many there are minor deformities which are an index of inferiority. Among the stigmata of inferiority I would include minor midline deformities, the Gothic palatal arch, nasal septal deflection, faulty alignment or disparity in size or colour of the eyes, epicanthic folds, misshapen ears, irregular patchy colouring of the hair, hernia, undescended testicle, varicocele, hypospadias, varicose veins and *genu valgum*.

Above all the mental defective should be eliminated. Too many were recruited during the late war. There is no reason why the circumference of the head should not be measured at attestation. Some simple tests of intelligence should be applied.

TABLE II.—PERCENTAGE OF GROSS TOTAL OF PENSIONS IN FORCE BY VARIOUS DISABILITIES.

Disability.	Percentage of Gross Total of Pensions Granted in			
	England.	Canada.	Australia.	New Zealand.
All Diseases of the Respiratory System	9.0	26.0	10.7	17.76
Pulmonary Tuberculosis	?	11.06	3.0	10.73
All Nervous Diseases	6.9	4.04	4.05	4.7
War Neurosis	5.6	2.0	3.57	4.47

Sex characteristics should be observed: the development of the genital organs, the distribution of the body hair, especially the contour of the upper margin of the pubic hair, the scalp and the eyebrows, the size of the pelvis and the locality of fat distribution. Generally males who approach the female type in size of pelvis, hair distribution and fat deposition or are lacking in the normal development of sex characteristics, make poor soldiers.

The work of George Draper, already referred to, demonstrates that sex character plays an important part as a factor in constitution and disease tendency. The degree of sex determination in differentiation towards maleness or femaleness are matters of first rate importance to the student of the human constitution. Gall bladder disease according to Draper's investigations is three to four times commoner in females than in males and his studies have shown that those males who develop cholelithiasis present a gynandro-morphic diathesis: the pelvis is wider, the emotional complex is more feminine, the fat distribution tends to female type, there is a high weight index.

TABLE III.—PRINCIPAL CAUSES OF REJECTION AND DISCHARGE OF RECRUITS IN THE BRITISH ARMY, 1923-1924.

Disease.	Ratio per 1,000 rejected on first examination.	Ratio per 1,000 discharged within six months of enlistment.
Defects of Lower Extremities	57.03	5.92
Diseases of Middle Ear	31.65	4.82
Loss and Decay of Many Teeth	36.13	3.68
Diseases of the Heart	53.42	2.24

Generally it may be said that many males affected by "disordered action of the heart," hyperthyroidism and potential hysteria present evidences of poorly developed sex differentiation.

Lastly a word about the soldier's heart.

Tachycardia and murmur should exclude the recruit from "A" class, a pulse rate above 90 unless there are signs of alcoholism should exclude, any form of murmur should be a bar to acceptance. Because a murmur is exocardial it does not follow that there is no disease. We are still as far as ever from a correct solution of the formula "disordered action of the heart." The old attestation paper includes one question: Is the heart normal? Would it not be better to ask how does the heart react to exercise? At least the pulse rate should be

recorded with the respiratory rate before and after a simple hopping test. Blood pressure records need not be insisted upon except in the case of elderly men. The urine should be voided in the presence of the examiner and chemical tests should be applied. In many respects Form XFD-8 is better than Form No. 2, the old New Zealand attestation sheet.

To make only casual allusion to defects and deformities of the lower extremities: An army marches primarily upon its feet, although it may have to fight upon its stomach. But with the general diffusion of orthopaedic knowledge due to the Great War we must assume that these defects will be closely observed in the future. The Surgeon-General's report of 1923 shows that defects of the extremities represented the highest ratio of rejections in the British Army of recruits after a few months' training.

Conclusions.

The lessons to be learnt from an examination of the attestation papers of New Zealand recruits during the Great War are these:

1. Men below the prescribed standards in weight and chest measurement should be classified B_3 if otherwise acceptable. The acceptance of C_1 men for special training is of doubtful value and they should not be considered to be fit for service overseas unless they show a considerable improvement in weight under graduated training. The minimal requirements of physical measurement laid down in the Royal Army Medical Corps Regulations for 1923 should not apply to New Zealand soldiers, as there is evidence that the average physique of our men is better than that of the British Army recruits.

2. The attestation form requires remodelling. The pulse and respiratory rate in relation to exercise should be noted, the nervous, glandular and genito-urinary systems require special tables in which their condition should be recorded. The ears of all recruits should be examined.

3. The medical officers selected for the important work of recruiting for mobilization should be specially trained in peace time under an assistant Director of Medical Services (recruiting) and a recruiting board should be set up in war time to consist of medical officers acting as principal medical officers of the various life insurance companies whose experience would fit them to this duty.

No form of physical inspection of recruits will eliminate all defectives or detect disease tendencies, but as evidence of the improvement in records we have the recent report of the Surgeon-General, which shows that rejection of recruits after a few

months' training has been much reduced by improved methods of examination and greater acumen in selection.

The elimination of waste, more especially in human material, is the paramount duty of the medical officer in the field, at the bases and in the homeland. In the homeland above all the conservation of productive man-power is a fundamental necessity.

MAJOR-GENERAL BARBER, Director-General Medical Services, Commonwealth Military Forces, referred to certain aspects of Colonel Carbery's paper which also affected citizen forces. He spoke of tuberculosis occurring in recruits shortly after enlistment and of the consequent charge on the superannuation fund of the Commonwealth. Mental deficiencies also became a burden to the community. He urged the necessity of training medical officers in the methods of examination of recruits.

COLONEL TRACY INGLIS, Director Medical Services, New Zealand Military Forces, stated that there was no doubt that the medical examination of recruits in the early stages of the late war had broken down mainly owing to the rush methods which had to be employed. The results obtained later by medical boards had been much better. In his experience the majority of the unfit who had been drafted into the Army, had enlisted in the early months and he considered that it was the duty of medical officers to correct this during any future mobilization. As regards New Zealand the authorities were at work on a new medical examination form which would include information lacking in the form used in the late war, especially regarding the ratio of pulse rate and respiration after exercise, the state of the nervous system and the examination of the urine. In the future the position would probably be met by an individual examination before the recruit entered a mobilization camp, to be followed by a strict and thorough examination by a medical board. He considered that in many instances a period in a mobilization camp would be necessary to detect latent disabilities.

COLONEL J. S. PURDY, D.S.O., V.D., Australian Army Medical Corps Reserve, pointed out that the problems of the paper under discussion suggested the advantage of a combined meeting with the Section of Preventive Medicine. He referred to the statement made recently by Major-General Beveridge that medical rejections on enlistment had increased from 20% in 1912-1913 to 35% in 1920-1921; the rate had become even higher. The findings of the commission on physical deterioration at the end of the South African war and the Gallway report at the end of the great war revealed that one recruit in nine was a chronic invalid quite unfit for any service. This indicated the need for improving the standard of physique of the people as far as could be done by physical education and training. The increase in the percentage of rejections for disabilities attributable to faulty nutrition and development should be regarded as a sign the diet of the people needed improvement.

LIEUTENANT-COLONEL HARDIE NEIL, New Zealand Medical Corps, stated that his observations of primary tentative recruiting systems under which medical officers were paid for each individual case, showed that consideration of border line cases was quite inadequate. As a ready means of detecting those below the standard in height, weight and chest measurement, the Pignet factor was useful. The weight in pounds *plus* the maximum chest measurement in inches *minus* the height in inches yielded a number of which 100 was the pivot or comparative normal. Below 100 the physique was poor or bad, 100 to 110 fair and above 110 good.

His experience had taught him that the number of ultimately proved useful men among those of poor physique was so few in comparison with the useless that the rejection of all these men was necessary in the interests of the fighting force and the finances of the country. In those claiming pensions for disability for catarrhal or infective ear lesions, he contended that when recourse could be had to previous information, the claimant's war history was almost invariably unsupported.

He pointed out that those between the ages of twenty and thirty years drawing a pension for chronic ear disease that was really of previous origin, would in the course of pensioning draw about seven hundred pounds and this showed the necessity for skilled examination of the ears in recruiting. Colonel Carbery had stated that those drawing pensions for ear disability in New Zealand comprised 2.9% of the total. He estimated that 70% of these men were not morally pensionable, as natural evolution of the disease was overlooked by the board. Aggravation or acceleration might have been allowed for. In his opinion this would operate in only about 10%. Speaking in reference to disordered action of the heart after experience in ambulances and on pensions business, he would arbitrarily reject any man with a pulse rate over 90.

LIEUTENANT-COLONEL A. R. FALCONER, C.B.E., New Zealand Medical Corps, considered that Colonel Purdy had struck the right note. The State medical examination of school children and military cadets gave the opportunity of instituting permanent medical case records which would enable early preventive measures to be taken regarding the individual and would also be of great value in ascertaining military fitness of a recruit in time of war. In America, he stated, they insisted at the universities on a medical examination of entering students and steps were then taken to overcome any physical disabilities. The medical oversight of the students in their recreations and studies continued during the whole course at the university.

Speaking as one who had considerable experience as president of a recruiting and an invaliding medical board, he considered that good work had been done by the home recruiting medical officers. He contended that it was impossible in the rush examination at a drill hall to do more than make a tentative preliminary examination and that the real test should be a period of training in camp.

His experience of the examination of invalid soldiers who returned from overseas with a certificate of medical unfitness due to prewar disability, led him to believe that a "non-try-out" in camp was a large factor in their conditions being overlooked. He drew attention to the fact that a term of three months was often insufficient to enable the question of determining unfitness of a probationer nurse to continue training in public hospitals and that recently the New Zealand Trained Nurses' Association had asked the Hospital Department to increase the term of probation to six months. It was thus obvious in comparison that the short preliminary examination in a drill hall, unchecked in camp, was quite insufficient for the responsible decision being given for a soldier's departure overseas.

AN INQUIRY INTO THE AFTER HISTORIES OF PATIENTS TREATED AT THE MILITARY SANATORIUM DURING THE YEARS 1919 TO 1924.

By W. AITKEN, M.D.

Medical Superintendent, Military Sanatorium, Cashmere Hills; Major, New Zealand Medical Corps.

Introduction.

The present inquiry was undertaken in order to determine the progress and condition of patients after they had been discharged from treatment and how they had fared when they returned to conditions of every day living with competition in business and labour circles. It was felt that a systematic inquiry into the after histories of discharged patients was desirable as by showing the ultimate fate of patients, it would demonstrate more accurately the results and benefits from the treatment received within the institution, than the

immediate results of treatment as gauged from the annual reports on the condition of patients discharged.

The Military Sanatorium was opened in 1919 and for the years under investigation returned soldiers who had developed pulmonary tuberculosis on service, were the only patients admitted. While tuberculous disease of the lungs displays very much the same characteristics in war pensioners as it does among the civil population in ordinary times, there are certain features which must necessarily be taken into consideration, when dealing with the after-histories of tuberculous service patients. To the everlasting credit of the New Zealand Government it must be said that they were extremely liberal in their efforts to provide every opportunity for recovery and treatment of the disabled men, and sufferers have been compensated by very liberal pensions. Facilities for obtaining treatment and adequate monetary allowances for maintenance of pensioners and their dependants, both during and after treatment, have given the returned soldiers opportunities for restoration to health which are often wanting amongst the civil population. In this institution, as in most hospitals and sanatoria in which service patients are treated, it has been a difficult matter to induce a certain proportion of the returned soldiers to avail themselves fully of the benefits and means provided for their recovery. The Sanatorium is the school of the patients with tuberculosis, where not only is the proper treatment of the disease carried out, but also habits of proper and careful living are inculcated amongst them. Recently freed from military discipline a certain number of these patients objected to the discipline and rules of the institution in which they were placed, and in their objections they were not alone blameworthy, as they were often upheld by many of the public who were anxious to show their gratitude and appreciation to those who had received war disabilities. Again, probably to the credit of the authorities they have been lenient with those pensioners who failed to cooperate in their treatment and also with refractory patients. However, such an attitude on the part of the authorities has rendered difficult the duties of those charged with the responsibility of taking care of the medical treatment of the pensioners. In drawing attention to the above which may be termed obstacles to the successful treatment of the disabled men, it may be pointed out that they were most in evidence for the first three years after the end of the Great War and that reports from Canada, Australia and the United States of America show that the same difficulties have been met with in the sanatoria given to the treatment of tuberculous ex-soldiers in these countries. Judging by the reports, these obstacles have been more troublesome in these countries than in New Zealand. The extent to which they have been met and overcome in this institution can perhaps best be judged by the immediate and late results of treatment.

The provision of total pension in addition to an economic pension to all patients for a period of twelve months at least, with pension according to

percentage disability in subsequent years, has relieved service patients from taking up an occupation at once. This abstention from work, along with freedom from worries as to maintenance of dependants, is a factor that must have considerable influence in helping service patients in being rehabilitated to civilian life and in helping them to keep well after discharge from treatment.

The method that is generally employed of reporting upon the after histories of ex-sanatorium patients, is to show the mortality rate of patients in successive years after discharge. In the present investigation it was thought advisable to show as far as possible the actual condition of the patients, as to whether the arrestment of the disease obtained under treatment had been made permanent or whether there had been any recrudescence of tuberculous activity, also to show their working capacity. An analysis of results of treatment upon such lines will reveal the degree of permanent benefit obtained by the patients more accurately than the reporting of mortality rates only. It is regretted that an investigation also into the mortality rates of ex-patients in comparison with the expected mortality rate of the general population could not be carried out, owing to the want of the necessary actuarial investigation, which would have permitted a comparison of results with similar institutions in America and the Old World.

Data Upon which the Report is Based.

The present report deals with 492 patients who were discharged from the Military Sanatorium during the years 1919 to 1924. From this number thirty-four were excluded from the investigation as they had less than two months residential treatment and thus it could not be claimed that they had undergone sanatorium treatment. The total number of patients discharged includes twenty-five who, after observation and investigation of their cases, were considered to have no definite evidence of pulmonary tuberculosis and were discharged accordingly. Of those discharged, twelve persons could not be traced and they also have not been included in the investigation. The number of cases thus dealt with in this report is 421.

Clinical Condition.

It must be noted in the first place that patients in all stages of the disease have been received into the Sanatorium and that no selection of cases was made. The only qualification for admission was that patients must have been service patients. Many patients admitted in the very advanced stages of the disease offered no hope of being improved under treatment, while in other advanced cases a temporary alleviation of their condition was all that could be expected. The reason for the admission of these patients with severe disease who were unlikely to benefit from treatment, was the fact that residential treatment elsewhere in suitable institutions was not available for this class of service patient whom the Government was responsible for caring for. In considering the aggregate results of treatment it has to be remembered that the material dealt with includes patients in all stages of the disease and

that there was no selection of cases, such as were likely to do well.

Classification of Cases and of the Results of Treatment.

All cases have been grouped in accordance with the following system of classification. The method of grouping resembles the Turban-Gerhardt system of classification, but it differs from it in that the constitutional symptoms have been taken into account.

Group I.—Patients with slight constitutional disturbances and physical signs of limited extent, namely in one lobe only. In the case of an apical lesion in upper lobe the signs should not extend below the second rib in front and in the case of lesions other than apical the signs should be limited to an area of equal extent. If present in more than one lobe, the signs must be limited to the apices of the upper lobes and not extend below the clavicle and spine of the scapula.

Group II.—All patients who cannot be placed in Groups I and III and at most the whole of one lobe affected.

Group III.—Patients with profound systemic disturbance or constitutional deterioration, with much impairment of function or with extent of disease greater than the whole of one lobe. All patients with grave complications, whether tuberculous or not, are classified in this group.

The following terms are used to describe the condition of patients on discharge from the Sanatorium.

Disease arrested means that the general health was restored in every respect; the signs of the disease in the lungs should indicate absence of activity. No tubercle bacilli were found in any sputum.

Much improved means that the general health was good; the pulmonary disease was at least quiescent. Sputum, if present, was free from tubercle bacilli.

Improved means that the general health was improved, but not restored.

Not improved means that there was no appreciable improvement in the condition of the lungs or in the general health.

After History Investigation.

The method of obtaining information of the present condition and progress of each patient was to send out circulars to all discharged, asking them to supply details of their present state of health, occupation, full time or part time and if they had had any break down in health since they left the institution. The tracing of many of the patients has entailed a considerable amount of clerical work. Valuable information as to the condition of many of the patients was received from the Pensions Department. The present condition as given of all patients can be taken as being fairly accurate, because being pensioners, they are medically examined for pension purposes every twelve months and those showing indications of activity are reported for in-patient or out-patient treatment. In addition, those residing in this district of North Canterbury attend periodically for medical observation. The fact that only twelve patients or 2.8% were untraced, must be considered very satisfactory.

The method of investigation followed has been to analyse the after histories of the patients with a view to determination of their present condition of health, as compared with their condition on discharge from treatment and also to record their present capacity for work.

The following terms have been used to describe the condition of the patients at the time of the investigation in the latter part of 1925:

Arrest maintained is used if the report from the patient was that he was continuing to enjoy good health and that there was no indication of the recurrence of tuberculous activity.

Stationary means that there was no appreciable improvement on the condition at the time of discharge. This group applies mainly to those who were deemed only to have been improved or not improved by treatment.

Recurrence of activity or worse.—The former term applies to cases of recurrence of activity in patients whose disease was considered to have been arrested or inactive at the time of their discharge. The latter term applies to patients who were classed as improved or not improved and whose condition has gone back since discharge.

Died.—This group includes readmitted patients who subsequently succumbed in the institution.

Died from other causes is employed in connexion with a few patients who were found to have died from accidental causes or causes other than tuberculosis.

Full work denotes that the patients were following a regular occupation. Those who reported that they were out of work or unable to find suitable work were not included.

Part work denotes that the patients were working a limited number of hours a day or only a few days a week.

No work.

The group "arrest maintained" includes a small number of patients in whom at the time of their discharge it was difficult to decide the presence or otherwise of activity and who in view of their condition being doubtful were classed as improved by treatment. Many of these patients have been found to have done well since their discharge, there being apparently no further activity and also they were working full time and consequently their inclusion in the "arrest maintained" group was justified. Similarly the group "stationary" contains a small number of patients whose disease was arrested under treatment, and in whom it was difficult to decide from their after history reports whether their state of arrest had been maintained or not. In these cases, while there was no definite indication of activity, their present condition, judging from the after history reports, appeared doubtful and the above course was followed in order to give the present condition of all patients as accurately as possible.

Tabulations of Results.

The preceding paragraphs will have served to explain the objects, scope and method of the inquiry.

The following table shows the condition in 1925 of 421 patients discharged in 1919 to 1924 inclusive. There were only eleven patients discharged in 1919 and as this number is too small for the percentage figures to be of any value, the discharges for that year have been included in the year 1920.

During the period under review, varying from one to six years, the total percentage mortality must be considered as satisfactory as the disease in 6.7% of all patients was in an advanced stage on admission and this number accounts for half of the deaths. Of the early suitable cases for treatment (Group I), the percentage mortality rate was 0.5.

The total percentage of patients at work is 55.8, which is perhaps disappointing. The numbers at work for the years 1923 and 1924, namely 47.4% and 30.9% are also disappointing. The explanation is that for the first twelve months after discharge, pensioners receive a full pension, as well as an economic pension, which latter ceases when they commence work. Thus there is no necessity for pensioners to take up an occupation for at least twelve months after their discharge and there is no doubt that the economic pension acts as a deterrent to many from working. It is not until the disability pension is assessed below 100% that the majority of these pensioners takes up an occupation. The figures for 1920 and 1921 show a better position and it is very probable that the position as regards numbers at work of those discharged in 1923 and 1924 will show an improvement in numbers in subsequent years, as pensioners have less pension money to rely on.

For Group I (early cases) the percentage number at work is 72.8. It is frequently said that ex-sanatorium patients as a class are lazy and unwilling to work, but the results show that only 10% of those ex-patients in groups I and II who were fit and able, are not working. If one were to inquire into the industry of healthy people, one would be likely to find that quite 10% were not working, through causes such as unemployment or from abstention from work by choice.

In the following tables the results are shown with regard to the three groups of cases. Table II gives the classification of the cases according to the extent of the disease and condition on admission.

The after history experience of these patients at the end of 1925, according to their condition on ad-

Distribution	Group I.	Group II.	Group III.	Total.
Numbers	195	198	28	421
Percentages	46.3	47.0	6.7	100.0

mission, is set forth in Table III in which the ultimate results of treatment are shown for the three groups of cases, early, middle stage and advanced.

TABLE III.—PERCENTAGE RESULTS AFTER ONE TO SIX YEARS, ACCORDING TO CLASSIFICATION ON ADMISSION.

Present Condition.	Group I.	Group II.	Group III.
Arrest maintained ..	83.6	53.6	0
Stationary ..	6.1	16.6	14.3
Recurrence of activity or worse ..	7.7	16.2	7.1
Died ..	0.5	13.1	75.0
Died, other causes ..	2.1	0.5	3.6
Total ..	100.0	100.0	100.0
At work ..	72.8	43.4	0

From a treatment point of view, it is pleasing to learn that the percentage of patients in Group I who had recurrence of activity, was only 7.7, while for Group II the patients with recurrence of activity amounted to 16%; also for Group I deaths after discharge were less than 1%, while for Group II deaths after discharge were 13%. These results illustrate the value of sanatorium treatment in early cases of pulmonary tuberculosis, while the results for Group II, keeping in mind the fact that the patients with favourable and unfavourable conditions were admitted, indicate that sanatorium treatment offers 50% of all middle stage cases the chance of securing a fairly permanent arrest of the disease. The opinion may be here expressed that with a longer term of treatment many of the 16% who suffered a recurrence of activity, might have secured a more lasting arrestment.

In Tables VII, VIII, IX and X are given the numbers and percentage results in patients divided into groups according to whether the sputum contained tubercle bacilli or not and according to the condition on admission.

The investigation of the after histories was also considered in relation to their condition on discharge and in relation to the results of treatment.

TABLE I.—PERCENTAGE IN EACH CATEGORY.

Condition of Patients in 1925.	Year of Discharge.					
	1920.	1921.	1922.	1923.	1924.	1919 to 1924.
Arrest maintained ..	64.0	69.6	61.0	61.5	57.1	63.9
Stationary ..	12.0	8.9	3.4	19.2	21.4	11.6
Recurrence of activity or worse ..	8.0	11.6	15.7	12.9	9.6	11.6
Died ..	15.0	8.9	13.9	5.1	7.1	11.4
Died, other causes ..	1.0	1.0	1.0	1.3	4.8	1.5
Total ..	100.0	100.0	100.0	100.0	100.0	100.0
On full work ..	59.0	58.9	52.8	37.2	14.3	49.2
On part work ..	4.0	4.4	4.5	10.2	16.6	6.6
Total at work ..	63.0	63.3	57.3	47.4	30.9	55.8

The object of this was to consider the after history results as compared with the condition after treatment, as well as before treatment. In Table IV the percentage results of treatment are given.

The classification of the patients at the time of their discharge and upon the results of treatment are substantially borne out by the condition of the patients as disclosed by their after histories. The group "arrested" includes cases from Groups I and II and the results show that for patients securing the arrestment of their disease under treatment, the outlook is particularly good. It also indicates that the classification of patients, adjudged to have had their disease arrested, has been carried out by sound criteria and selection.

When the after history results according to the condition on admission are compared with the results according to the condition on discharge from treatment, there is a fairly close similarity between the figures. This would indicate that the results of treatment both immediate and ultimate depend upon the extent of the disease and condition of the patient at entry for treatment.

Table VI deals with the mortality rate in a way which is not exactly scientific, but in the absence of actuarial investigation is useful as showing the mortality after history experience.

The reports from the twenty-five patients who were discharged as having no definite evidence of

tuberculosis, show that all were in good health and at work. There were none of these patients who developed tuberculous manifestations.

Summary.

An investigation to determine the post-sanatorium experience of 421 discharged patients and the usefulness of the sanatorium treatment has been carried out.

For Groups I and II a considerable measure of success has been revealed.

With reference to Group I, the arrest of the disease secured under treatment was maintained in 83.6%. The percentage at work, 72.8, also shows that the sanatorium has played a useful part in rehabilitating to civilian life tuberculous exsoldiers.

With reference to Group II, the percentage with arrest of the disease maintained was 53.6 and the percentage at work 43.4. It may be claimed from the results of this group of cases in the middle stages of a grave disease such as is pulmonary tuberculosis, that the treatment as set in the institution has been amply justified.

In regard to Group III, the inquiry shows that the inevitable results of late diagnosis are not offset by sanatorium treatment; 75% of the patients in this group having died within from one to six years after discharge. In determining the usefulness of the work of the institution, the value to the community of the segregation of highly infectious

TABLE IV.

Distribution.	Result of Treatment at Discharge.				
	Arrested.	Much Improved.	Improved.	Not Improved.	Total.
Numbers	259	60	50	52	421
Percentages	61.6	14.2	11.9	12.3	100.0

TABLE V.—GIVING THE PERCENTAGE RESULTS AFTER ONE TO SIX YEARS ACCORDING TO THE RESULTS OF TREATMENT ON DISCHARGE FROM THE SANATORIUM.

Condition in 1925.	Result of Treatment at Discharge.			
	Arrested.	Much Improved.	Improved.	Not Improved.
Arrest maintained	83.4	56.7	38.0	0
Stationary	3.1	13.3	28.0	36.5
Recurrence of activity or worse	11.2	23.3	8.0	3.9
Died	1.1	5.0	24.0	57.7
Died, other causes	1.2	1.7	2.0	1.9
Total	100.0	100.0	100.0	100.0
At work	70.6	43.3	32.0	5.7

TABLE VI.—PERCENTAGE OF PATIENTS DISCHARGED EACH YEAR WHO DIED IN SUCCESSIVE YEARS SINCE DISCHARGE (LESS THOSE WHO DIED FROM OTHER CAUSES).

Year of Discharge.	Total Number Discharged.	Period in Years Since Discharge.				
		One.	Two.	Three.	Four.	Five.
1920	100	9.0	10.0	13.0	15.0	15.0
1921	112	5.4	6.2	8.0	9.0	..
1922	89	11.2	16.8	17.9
1923	78	3.8	5.1
1924	42	7.1

patients has to be indicated, also the nursing care and alleviation of suffering of patients in a hopeless stage of the disease, which the Dominion Government was responsible for providing for.

I am indebted to Lieutenant-Colonel A. D. Carberry, C.B.E., Officer in Charge of Treatment, Pensions Department, for permission to publish this report.

TABLE VII.—PATIENTS WHOSE SPUTUM DID NOT CONTAIN TUBERCLE BACILLI ARRANGED ACCORDING TO THE STAGE OF DISEASE.

Distribution	Group I.	Group II.	Group III.	Totals.
Numbers ..	190	125	2	317
Percentages	59.9	39.4	0.7	100.0

TABLE VIII.—THE PERCENTAGE RESULTS AFTER ONE TO SIX YEARS ACCORDING TO THE CLASSIFICATION ON ADMISSION.

Condition in 1925.	Group I.	Group II.	Group III.
Arrest maintained ..	83.7	66.4	0
Stationary ..	6.3	12.8	0
Recurrence of activity or worse ..	7.9	15.2	0
Died ..	0.5	4.8	50.0
Died, other causes ..	1.6	0.8	50.0
Totals ..	100.0	100.0	100.0
At work ..	72.6	54.4	0

TABLE IX.—PATIENTS WHOSE SPUTUM CONTAINED TUBERCLE BACILLI, ARRANGED ACCORDING TO THE STAGE OF DISEASE.

Distribution	Group I.	Group II.	Group III.	Total.
Numbers ..	5	73	26	104
Percentages	4.8	70.2	25.0	100.0

TABLE X.—THE PERCENTAGE RESULTS AFTER ONE TO SIX YEARS, ACCORDING TO THE CLASSIFICATION ON ADMISSION.

Condition in 1925.	Group I.	Group II.	Group III.
Arrest maintained ..	80.0	31.5	0
Stationary ..	0	23.3	15.4
Recurrence of activity or worse ..	0	17.8	7.7
Died ..	0	27.4	76.9
Died, other causes ..	20.0	0	0
Total ..	100.0	100.0	100.0
At work ..	80.0	24.65	0

LIEUTENANT-COLONEL A. D. CARBERRY, C.B.E., V.D., New Zealand Medical Corps Reserve, pointed out that the diagnosis was so difficult in early tuberculosis that the results of treatment in sanatoria must be accepted with reserve. Diseases of the oro-pharynx, apical collapse due to nasal obstructions and nasal sinus disease and above all latent syphilis had been confused with the first stage of lung tuberculosis only too frequently.

Stereoscopic radioscopy of the thorax was, he considered, of equal importance with clinical examination and some perfected technique of complement fixation for tuberculous infection was urgently required. The Wassermann test should be done as a routine.

LIEUTENANT-COLONEL HARDIE NEIL, New Zealand Medical Corps, congratulated the author of the paper on the excellent results recorded. He considered that the obviously scientific method of discriminating the groups and of recording results made the paper most valuable. The great value of the contribution was the comfort it gave to the

taxpayer who had been called upon to contribute liberally to the support of the tuberculous patient. In his opinion the greatest importance, however, was to the future administrators who would have a sound basis for the policy in regard to recruiting precautions and treatment. Thus the very expensive administration and treatment could be curtailed and costly experiments in the war eliminated.

Major W. Aitken, in reply to Dr. Hardie Neil, who had mentioned the question of attributability pointed out that the final decision in this question rested with the War Pensions Appeal Board, a body composed of a Supreme Court judge and two medical practitioners who, as far as he knew, had given no special study to tuberculosis.

He pointed out that Colonel Carberry had stated that the percentage of pensioners accepted for tuberculosis was higher in New Zealand than in other allied countries and considered that the fact that the authorities in New Zealand were very sympathetic towards applicants for pensions due to this disability, would help to explain this higher rate. In other countries clear evidence was required by the authorities before a pension was granted. Major Aitken also explained that all patients in his series in whose sputum tubercle bacilli were not detected, were closely examined and scrutinized for the purpose of justifying the diagnosis of lung tuberculosis. Routine examination of the nose and throat was carried out in all cases for the purpose of recognizing chest disease depending on chronic nasal conditions. Sanatorium physicians were limited in their clinical investigation owing to the fact that sanatoria were usually medically understaffed. When the staffs of these institutions could undertake an intensive study of each individual patient he was sure they would then produce better results than those obtained at present.

TUESDAY AFTERNOON, FEBRUARY 8, 1927.

COMBINED MEETING.—SECTIONS X AND XI.

THE TREATMENT OF THE CRIPPLED SOLDIER IN WAR AND PEACE.

By H. SIMPSON NEWLAND, C.B.E., D.S.O., M.S., F.R.C.S.,
Honorary Surgeon, Adelaide Hospital.

SURGEON-GENERAL BARBER has asked me to open this discussion on behalf of the Section over which he has the honour to preside, and I do so with pride tempered by misgivings.

It is very right that the two Sections should combine to consider the treatment of the crippled soldier in war and peace, because orthopaedic surgery plays so great a part in military surgery. Prior to the Great War this was not so. During the nineteenth century and after surgeons in civil life tended more and more to confine their attention to the surgery of one or other of the several anatomical systems of the human body. This growth of specialization had not been reflected in military surgery. The first eighteen months of the Great War made apparent the need for the segregation of certain types of casualties. As a result, special hospitals and sections of hospitals for head injuries, face injuries, cardiac disorders and lung conditions following the use of poison gas were established in 1916. The need for orthopaedic hospitals became still more urgent, because of the huge preponderance of wounds of the extremities with concomitant or subsequent damage to function. In Great Britain patients with orthopaedic conditions were segregated in specially staffed and equipped

centres where continuity of treatment, operative, manipulative and educational, could be secured for such conditions as injuries to peripheral nerves, ununited and malunited fractures, injuries to joints and those likely to result in deformities of the extremities. Later on fractures of the femur were included. The orthopaedic centres began with 250 beds and expanded until at the conclusion of the war they amounted to nearly 30,000. These figures show the scope and importance of orthopaedic surgery in a great war.

In this short introduction to the discussion I propose to consider the treatment of the crippled soldier under three headings: (i) The period before the battle, (ii) the period during the battle, (iii) the period after the battle.

The Period Before the Battle.

Strictly speaking the crippled soldier does not exist before battle, but there is such a vast field for preventive orthopaedic surgery that I hope it will not be out of place to refer briefly to this aspect of the subject. It assumes a much greater importance when a national army is raised by conscription because a large number of men unfit for service can be made so. Under a voluntary system of enlistment this is not possible to the same extent. In the late war the menace to Great Britain and the United States led to the adoption of conscription and the physical defects of large numbers of the recruits offered an extensive field for orthopaedic surgery. Belgium has hitherto been known as the cockpit of Europe, but the progress of science has so annihilated time and space that the possibility of the next great struggle being centred in the Pacific is not remote. Situated as Australia is on the boundary of this vast arena, her safety may be so menaced that conscription will be forced upon her. The orthopaedic service of the army will have to insure that recruits with certain kinds of physical unfitness can be trained to have the greatest possible vigor for combat or other military service. The many defects and deformities, such as damaged semilunar cartilages, *hallux valgus*, *pes cavus*, Dupuytren's contraction and so forth, would demand treatment.

It is obvious that the training of the personnel in the proper use and application of splints comes within the scope of preventive orthopaedic surgery.

The Period During the Battle.

In war the military machine must work smoothly to prevent deformity and to restore the wounded soldier to his unit or civil life with the least possible interference with function. Efficient orthopaedic surgery means much to the man-power of a nation. This efficiency is not only necessary in the orthopaedic centre at the base. It should be demanded just as strongly from the advanced units. Treatment in advanced units, even in the regimental aid post, has a profound influence not only on immediate danger to life and limb but on the ultimate result. The prevention of deformity must be there begun and thereafter intelligently and persistently continued.

The extensive application of the principle of excision of wounded contaminated tissue before the onset of infection has revolutionized the treatment of wounds and rendered possible the prevention of deformities. This measure more than any other has led to the preservation of movement and function not only in military but also in civil surgery. The utmost conservation is necessary compatible with the preservation of life.

Excision of contaminated wounds is most effective when done early, as sepsis is thereby prevented and sepsis is the chief begetter of deformity and loss of function. Shock and hæmorrhage cause delay in the application of the principle of excision. Their prompt and effective treatment prevent the onset of sepsis and gangrene. Gangrene demands the excision of a muscle or muscles or amputation. All this spells deformity and loss of function.

In addition to the speedy and effective treatment of shock and hæmorrhage the tourniquet must be avoided as much as possible and if used, placed just above the wound. Bandages must be carefully applied. I know of a tragic case in the late war in which a badly wounded soldier was transfused with blood at the bend of the left elbow after the amputation of his right arm. The dressing and bandage were applied to the left arm with the elbow joint extended. The elbow was then flexed and placed in a sling. The flexion caused constriction by the bandage, gangrene resulted and the remaining arm had to be amputated. The dressing of large deep wounds is important. A large flat dressing will prevent the escape of infected effusions. All loose *débris* should be removed and gauze, medicated or otherwise, with paraffin *et cetera* placed between the deep surfaces. To prevent jarring movements in these large wounds of the thigh, with or without fractured femur, a Thomas's splint is necessary. Obvious missiles, foreign bodies and loose displaced fragments of bone should be removed as their displacement during transport is fraught with danger. The importance of effective splinting for transport is shown in fracture of femur. For this the Thomas's splint is ideal. The Thomas's splint was not generally used early in the war. The first Thomas's splints I understand were taken to France by Sir Alexander MacCormick with the Lady Dudley Hospital. With the exception of morphine and anaesthetics nothing in my opinion was so instrumental in preventing pain as the Thomas's splint. Prior to its use the agonies during transport of a patient with fractured femur were terrible and sometimes lethal.

Before the employment of the Thomas's splint became general, the mortality of fractured femurs in casualty clearing stations alone in so called peace times was nearly 50%. Later on, in the opening phases of a big battle prior to which the use of the Thomas's splint had been demonstrated in all the field ambulances of one of the armies concerned, the number of cases of fractured femur was 1,009. The mortality was 15.6% or a reduction of over 30%. In addition, the patients were in such good condition that all except 5% could be submitted to operation at once.

The amputations in this series were 17·2%. The prevention of ultimate deformity cannot be estimated. A Thomas's splint drill was devised during the war and the training of the personnel is necessarily of the utmost importance.

Work at Clearing Stations.

The quality and organization of the work in casualty clearing stations has a very special influence on the prevention of deformity. Efficient administration is most important together with ample staff and equipment. Except in "quiet times" in the Great War the "walking wounded" seldom got the prompt treatment of their wounds that "stretcher cases" received. In a discussion with Sir Anthony Bowlby he told me that there were never enough surgeons to allow of this and yet from a man power point of view it is the walking wounded it pay best to treat. The delay resulted too often in sepsis and crippling deformities of the upper extremities. In fact, as the great bulk of adequate surgical work is done in the clearing station, it is not too much to say that the future of the wounded soldier is largely made or marred at this stage. Skilful excision of wounds spells success more than any other measure and this demands a keen blade and a keen brain. The greatest care must be exercised in the selection of medical officers and nurses. I once heard a member of a surgical team condemn Syme's amputation at the ankle joint because in twelve consecutive cases the heel flap had sloughed. He was condemned out of his own mouth.

Officers in charge of the dressing or receiving room whence the soldier is sent to his destination, are from a surgical point of view very important. The fate of the patient is largely in their hands. They have to decide whether the man is fit for operation or should be retained or sent on.

The operating surgeons in casualty clearing stations must be men of quick, sound judgement with a rapid technique. They must possess a complete understanding of the principles on which successful treatment of war wounds depends. In the great majority of cases wounds can be excised and sutured in the pre-inflammatory stage, that is before surface contamination has become an infection. As Colonel H. M. Gray writes: "The capacity of the surgeon can be measured by the number of secondary operations which have to be performed on his patients, by the number of primary sutures which break down, or by the number of wounds he has sutured which do not reach the base without inflammation having been stirred up."

It is important that transport from the casualty clearing station to the base should be smooth and medical officers can assist in this.

From the earliest possible moment deformities which are apt to follow upon injuries to nerves or muscles or from the action of gravity, must be prevented by postural treatment, splints or other means, for example, the cock-up splint for severed musculo-spiral nerve and the foot rest for fractured femur. When the missile has caused gross loss of muscular substance, the damaged muscle must be fixed in re-

laxation. Deformities from contraction of muscles, peri-articular adhesions and intra-articular adhesions should be anticipated and prevented. In many cases the frequent evacuation from one hospital to another prevents close and continuous supervision and the employment of that suggestive encouragement which is so essential to recovery.

The Period After Battle.

The stage after battle includes the treatment of the wounded soldier at the base and afterwards in the orthopaedic centre up to his discharge or return to his unit. At this stage his wound will be healed, healing aseptically or will be the subject of sepsis. Sepsis is the foe of function, so that measures must be employed to get rid of it.

Function is the goal of the orthopaedic surgeon and he should know it and be able to practise the best way of obtaining it. The value of skilful treatment in the orthopaedic centres in the late war is shown in the case of fractures of the femur. At one period there were five hundred compound fractures of the femur yielding an average shortening of less than twelve millimetres (a half of an inch) and in none was internal splinting resorted to.

It is not necessary to dwell on the valuable curative and educational work carried on in orthopaedic centres. It was founded largely on the knowledge that voluntary movements are of much more value than passive movements. Productive educational treatment was found to promote recovery more quickly than were exercises with tools.

THE CRIPPLE IN WAR AND IN CIVIL LIFE.

By R. B. WADE, M.D., Ch.M. (Sydney).

Honorary Surgeon, Royal Alexandra Hospital for Children, Sydney.

WHEN asked to open the discussion on the subject of the cripple in war and in civil life, I felt that on the former subject there was little left to say at this stage, except to emphasize the need that exists for orthopaedic surgeons to be enrolled by the military authorities for two reasons. In the first place to insure the efficiency of the soldier by having expert opinion to guide the authorities in the matter of elimination of the two great disabling factors in marching, foot and back strain; in the second place to aid in the earliest return of the wounded man to a condition of functional activity.

We need not fear that any war in the near future will find our medical military authorities unprepared and we can be sure that they will have a schematic nucleus of medical service that will include the orthopaedic side and will insure that there will be a sufficiency of surgeons with this training who will look to the restoration of function at an early stage.

To the lessons taught during the late war the influx of surgeons professing orthopaedic surgery as their special line of work in Great Britain and in the Dominions is due and to the pioneer of all

orthopaedic surgery in the United Kingdom we must give our meed of reverence and praise to Robert Jones, of Liverpool and thus indirectly no less to Hugh Owen Thomas, his uncle of the same city.

We can thus say with some degree of satisfaction that, should the world be again afflicted with war in our time, there will be men of experience ready to take their place and part and we trust that an early use will be made of their services and advice, so that when the need for their class of work becomes due, they can have adequate staff and facilities at hand to allow the work of functional cure to be embarked on as soon as possible.

Though, for the present, we can put aside the question of war cripples, we have two classes of cripple that are always with us. We must confess that these cripples are not receiving the care and attention from the community to which they have the right. These are the adults crippled by accident, the children crippled by congenital causes, by birth injuries or by disease attacking them in the first few years of life.

The greatest trouble we have in stimulating any interest on this subject is all lack of definite information and our inability to give accurate figures of the numbers in the community so affected. Until a survey has been carried out and some accurate information obtained, we must be confined to the inference drawn from the known figures in other countries.

Perhaps the most important figures that are lacking and yet that could be compiled by a Government department without much difficulty, are those relating to the number of adult cripples receiving relief under an invalid pension.

For accurate figures we must look to the surveys done in America at the cities of Cleveland, New York and Chicago; they all agree roughly in their estimates that there are six cripples per thousand of the population and that 30% of these are under twenty-one years of age. Thus:

The cripples under six years are	4%
From six to fourteen	18%
From fifteen to nineteen	7%

They find the causes producing cripples are:

Disease	69%
Congenital causes	25%
Accident	4%
Other causes	2%

The crippling period in the child is:

Birth	25%
One to five years	53%
Six to fifteen years	15%
Sixteen to twenty-one years	2%

The causes of crippling are:

Infantile paralysis	51%
Spastic paralysis	16%
Tuberculous disease of bones and joints	7%
Congenital defects	10%
Others, such as amputation, osteomyelitis and muscular dystrophies	16%

Out of a total of some fifteen hundred cripples it was found that 90% had disability of the legs and 20% disability of the arms, this naturally having a distinct bearing on the vocational outlook of the crippled child. Of this group, 14% had an obvious

mental handicap, the remainder not so; of the mentally handicapped 18% were suffering from spastic paralysis. Have we any right to conjecture that a similar state of things exists in our own countries of New Zealand and Australia? Infantile paralysis causes half the total amount of crippling. Have we not both had our similar large outbreaks? Our position may be much the same. Cannot we consider our position as regards congenital deformities and spastic defects will be similar? Probably we suffer less from tuberculosis than do the large American cities; still this is found to be the least cause of disability, only registering 7%.

We may then with justice consider that these figures represent accurately enough our own percentages and we may then take it from this that in New Zealand on its population basis there must be some nine thousand cripples of whom some three thousand are under the age of twenty-one and in Australia some thirty-six thousand of whom twelve thousand are under twenty-one.

An American estimate gives 3,654 for New Zealand and 15,741 for Australia based on the above method of calculation. The estimation of these crippled children has been based on one of the following definitions: "One whose movements are so restricted by accident or disease as to affect his capacity for self-support" (Board of Inquiry of Birmingham). "Cripples shall be considered persons whose muscular movements are restricted by disease, accident or congenital deformity" (The Chicago, Illinois, United States of America, Survey for Crippled Children). "A crippled child is one whose activity is (or due to a progressive disease may become) so far restricted by loss, defect or deformity, of bones or muscles as to reduce his normal capacity for education or self-support" (The New York State Commission for Crippled Children).

We must then ask are these numbers enough to justify some movement in their favour, do they need it, are adequate medical facilities provided, adequate education both academic and vocational?

If some such movement is justified, how can the lot of these be ameliorated and what are the disabilities under which they live?

Medical Facilities.

Are adequate medical facilities provided? I think we can say on the whole that however poor the patient may be, his means of access to suitable surgical treatment is adequate and as more and more men are taking an interest in orthopaedic matters, the only reason for inadequate treatment is the apathy or hopelessness of the parents. They have access to public hospitals and orthopaedic departments, the latter still capable of improvement and sure of improvement as more young and enthusiastic orthopaedic surgeons come to the front. Could this residue, who are untreated or in whom treatment is given up too early, do better with any help and what should be the nature of the help?

The Education of Cripples.

The education of these children may be said in any case to be deficient. No means are at hand for

either academic or vocational training. My own experience is to the effect that in New South Wales at any rate these children are unable to attend school efficiently. The illness occurring as it does in the early years and persisting through the main school years renders education impossible and these children are but partially educated or totally uneducated. Can this be got over in any way? They cannot spare the time when wholly under treatment and when past this stage and partly under treatment or when recovered, many cannot be transported there.

As the child devoid of academic training is likely thereby to be a charge on the community and unable to earn a living, the necessity of academic training is of the first importance. Secondly, as the cripple will be in some way incapacitated, he will need to be confined to a limited number of trades and occupations whereby he will be able to earn a living, in many cases not a full living as his activity will be lessened and he must be a slow worker. There is thus need for special vocational training and what that is to be is not yet known, as not enough has yet been done to ascertain it and it must still be experimental.

Can any means be obtained by which they can attend school while under treatment, school in hospitals, in convalescent homes, transport to school, combination of school and hospital?

Is this a matter of State control, finance and management or one of public charity?

Is the matter serious enough for one or the other?

In Great Britain and America various societies of a charitable nature have been formed to look after the interests of these young cripples; in England the Central Council for Cripples, in America the International Society for Crippled Children and in addition or allied to these main bodies are various voluntary bodies whose basis is some social organization, such as rotary clubs, the association of Schreiner and the like. In America, as a result of the organization and influence of this international society, some of the States have brought in legislation to undertake their supervision, have provided educational facilities and have allotted sums of money towards the object of their cure.

I think that this is a suitable occasion when we orthopaedic surgeons to whom the claims of the cripple come home more acutely than to perhaps any other class of the community, for it is we who see most of their troubles and needs, should come to some conclusion as to whether there is any need to stir up public opinion as to their wants and then to be able to give some concrete plan whereby they may be catered for. First, we should make up our minds if we should be the pioneers to organize such a campaign and, if so, by what means. After all we know that any work that can be done, will be done only by exciting public interest in the matter. If societies are formed who will interest themselves, so will the public be awakened to the need and last of all in this way will be awakened the interest of the politician, legislator or whatever he may be called who will then make the State do its share.

I feel that it is a function of the State to cope with this. Under our existing system of government I cannot see any hope of State intervention until public opinion has been stimulated by means of voluntary associations who, in the first place, will prove by experiment what are the exact requirements and who will secondarily interest the public and so parliament into the required legislation.

What are the functions that a voluntary organization could carry out? They could see that (i) adequate orthopaedic treatment is provided. This will in the main be the function of district visitors to encourage the parents to look to the organization and to point out the advantages therefrom. A voluntary organization could arrange (ii) that those of school age should have adequate academic training both while in hospital and that whilst out-patients, adequate motor transport should be given to take them to and fro. It could see (iii) that special schools for the crippled either in connexion with the hospitals and out-patient department or in general schools with proper means of transportation are found. It could also undertake (iv) that convalescent homes where educational facilities exist are installed. It could take steps (v) to institute vocational schools either at special schools or convalescent homes and, in the case of the former, transport thereto. (vi) It could make arrangements with unions and arbitration bodies whereby the crippled slow worker may be allowed to obtain a living. It could also be its function (vii) to seek legislation to the effect that the State should (a) provide sufficient money or adequate means to supply facilities for surgical treatment, academic and vocational education, convalescent homes and so forth, (b) enforce, for instance by means of a Children's Court, that all such children should have access to such facilities.

MAJOR-GENERAL G. W. BARBER, Director-General Medical Services, Commonwealth Military Forces, stated that as far as he could ascertain Thomas's splint was not in universal use in mining and timber districts and on the railways in Australia, places where its use would be of much importance.

COLONEL D. S. WYLIE, New Zealand Medical Corps, traversed the work that had been done for soldiers and crippled children in New Zealand. A complete orthopaedic unit had been sent out from New Zealand after the war, consisting of surgeons, mechanics, plaster-workers and assistants. The experience had been that orthopaedic treatment must be provided much earlier, as it was not until 1918 that it had been put on a satisfactory basis in New Zealand. By that time crippled men requiring treatment had been scattered throughout the country. Orthopaedic hospitals had been established at Christchurch, Trentham and Rotorua. As soon as the soldier patients had been discharged from the hospital at Rotorua children had been admitted. In the South Island crippled children had been catered for at the public hospitals at Christchurch and Dunedin. In all 150 children were treated. Facilities for education had been provided for the children as well as special vocational training.

He did not think that any special propaganda was necessary as the relatives of these children would disperse the knowledge of the results obtained and thus educate public opinion.

He dealt with the crippling which resulted from septic wounds in industry and mentioned that because an injury was "only a septic finger," it was often treated lightly. He thought that better treatment should be instituted in the

initial stages, especially from a physiotherapeutic point of view as many of the patients suffered great disability at a later period.

DR. N. D. ROYLE (Sydney) suggested that some arrangement should be made with workers' unions and similar bodies. As long as a man was receiving a pension, the question of cure was of minor importance to him. He suggested that a curative workshop for industrial cripples would be a benefit just as education for a crippled child was of economic benefit to the State.

DR. J. RENFREW WHITE (Dunedin) thought that no special campaign was necessary in New Zealand as the public had seen the results of orthopaedic treatment and knew where such treatment could be obtained. He paid a tribute to the Department of Health and hospital boards for the manner in which they dealt with the recent epidemic of infantile paralysis in New Zealand. He thought that a follow-up system should be instituted to prevent deformities occurring after a number of years.

Speaking of the cripple of industry he thought that much could be done and that there was great scope for better treatment especially in compound injuries. If any propaganda campaign were necessary, it should be in the direction of the education of insurance company managers who should take an interest in the early stages and progress of the affections. He emphasized the necessity of teaching younger practitioners and country practitioners the elements of orthopaedic surgery, so that they might know what disabilities to expect.

DR. F. F. A. ULRICH (Timaru) thought that until the principles learnt in the war had been taught and assimilated, practitioners would be lacking in what he termed orthopaedic sense.

DR. A. OWEN-JOHNSTON (Invercargill) thought that a great deal of crippling in industry was preventable, but he blamed the insurance companies who kept on paying and were not concerned whether the patient was being well treated or, for that matter, treated at all. He mentioned that in Vienna a special hospital had been opened and subsidized by the insurance companies. Treatment of industrial injuries at these hospitals was compulsory and a saving of a sum in the proximity of £18,000 had resulted in one year.

DR. J. S. PURDY (Sydney) dealt with the introduction of the *Workers' Compensation Acts* in Queensland, Western Australia and more recently in New South Wales, with the liability for payment by the employer of up to £50 for medical treatment. He thought that the fact that the employers were covered as a rule by insurance companies (in the case of Queensland the Government had the monopoly of industrial insurance) made the insurance companies recognize the need for the establishment of large orthopaedic centres in these cities. In Birmingham the insurance companies subsidized such a centre. It seemed to him that in the future there would be such centres in all the large Australian cities to which such patients could be drafted from the general hospitals.

DR. A. R. D. CARRERY (Wellington) said that experience in France had demonstrated that casualties on the march were frequently due to pre-war orthopaedic disabilities. He condemned orthopaedic treatment for prospective soldiers as it tended towards malingering later. He would exclude such men from acceptance for active service in the infantry.

COMBINED MEETING—SECTIONS V AND VIII.

DELINQUENCY IN NEW SOUTH WALES.

By HARVEY SUTTON, M.D., D.P.H.,

Principal Medical Officer, Education Department, New South Wales.

As an example both of relativity in human behaviour and of an artificial selection based on conduct delinquency is too difficult a subject in our

present state to permit of anything more than a limited glimpse at one or two of its facets. The angle I propose to take is based on the experience statistical and otherwise gained at the Children's Court, Sydney, and the Truant School, Guildford, together with many special cases examined at head office or at institution. Truancy has been included as a common preliminary and indeed is inseparable from the major problem of delinquency.

The Children's Court is under the supervision of a special magistrate with extensive powers, who conducts a careful investigation stripped of legal formality. Before final decision in the case he has before him a physical and mental estimate of the child. The present law, *The Child Welfare Act* incorporated in 1923 various acts dealing with neglected or uncontrollable children or juvenile offenders and changed the age limit from the sixteenth to eighteenth birthday. The charges are often trivial in importance, such as "scaling" on trams, but many (about 40%) are serious. Where the charge is sustained the magistrate decides whether the boy should be released on probation (for example, as a first offender) or committed to an institution (16%). Boys under fourteen go to the Mittagong Farm Home or to the Truant School, Guildford. Those over fourteen years of age go to the Training School, Gosford. Here, living in excellent open air conditions they attend school and carry out practical duties under close but encouraging supervision. Release is at the discretion of the authorities and is usually three months or more for the new admissions at the Truant School, six or seven months for repeaters. Similar periods obtain at Mittagong; longer periods at Gosford.

A School Medical Officer is attached to the Metropolitan Children's Shelter which temporarily houses those truants and delinquents on their way to institutions and thus chiefly represents the serious cases.

The physical findings are given for the two periods corresponding to boys under sixteen and under eighteen groupings.

All forms of physical defect are in excess as compared to the usual findings in the child population in which the frequency findings are defects of vision 5% to 9%, of hearing 1% to 3%, of the nose and throat 15% to 20%, of the heart 0.5% to 1%, hernia 0.5% to 1%, epilepsy 0.1%, gonorrhoea, rare. The frequency among delinquents is 12% defects of vision, 5% to 7% defects of hearing 37% of the throat and nose, 1% heart defects, 1.6% hernia, 0.6% epilepsy, 0.3% gonorrhoea. Hearing and nose and throat defects seem prone to cause or at least intensify maladjustments with school and everyday life. The deaf person rarely accepts the finding that he is deaf. He frequently misses orders and instructions given by the teacher or the remarks of others and so tends to be thought incorrigible for failure to obey some order he has not heard. In his reaction to the unjust treatment he gets, he is likely to play truant and to get amongst bad older companions when truanting.

Nose and throat defects largely by the chronic disturbance of sleep cause wandering attention (aproxexia) retardation and instability.

Epilepsy hardly needs stressing as a cause of abnormal conduct and of mental deficiency.

Visual defects affect conduct less often, but may interfere with educational progress and indirectly cause dissatisfaction and discontent because of retardation.

Truancy has been included in the comparison of figures, as irregular attendance at school arises from similar causes as delinquency. Indeed, the problem of truancy, though not identical, is intimately bound up with the larger problem of de-

linquency. Of the truants at the Truant School 24% were delinquents. The history of truancy is very common among delinquents at the Shelter. The Binet findings are similar, though retardation, the result as well as the cause of the truancy bulks higher together with feeble-mindedness at the Truant School. Again, the influence of failure in family life, especially on the part of the father, occurs in both truancy and delinquency to a similar extent.

This parental failure appears to be the predominant element in causation. Industrialism, with its vicious circles of poverty and large families, overcrowding and lack of amenities in home life, intemperance, lack of playing spaces, increased

TABLE I.—METROPOLITAN CHILDREN'S SHELTER—PHYSICAL DEFECTS—PERCENTAGES.

Defect.	Period 1921-1922-1923, 1,948 Boys.			Period 1924-1925-1926, 3,694 Boys. ¹		
	Gross.	Slight.	Total.	Gross.	Slight.	Total.
Vision	2.7	6.6	9.4	3.4	6.9	10.3
Eyes	0.5			0.36		
Lids	0.6			0.9		
Squint	1.2			0.9		
Total			11.7			12.46
Hearing	2.3	5.2	7.6	1.36	3.7	5.0
Ear Discharge		0.7	0.7		0.84	0.84
Chronic Nasal	—	0.5	0.5	—	0.33	0.33
Septum	1.5	1.9	3.4	0.86	0.86	1.72
Turbinates	1.9	1.5	3.4	0.90	1.05	1.95
Adenoids	0.2	0.4	0.6	0.23	0.57	0.8
Adenoids and Enlarged Tonsils	1.1	1.4	2.5	0.75	1.0	1.75
Enlarged Tonsils	9.9	2.6	12.5	10.9	5.2	16.0
Total Throat and Nose	14.6	8.3	22.9	13.34	9.02	22.4
Total Operations						37.4
Dental			51.3			50.3
Skin (scabies, etc.)			5.4			2.4
Lungs (bronchitis)			1.1			1.3
Heart			0.3			1.3
Malnutrition			12.2			
Malnutrition and Anæmia			2.7			2.75
Hernia			—			0.6
Total with Operations			0.7			1.4
Epilepsy			4.6			0.5
Speech			11.5			2.7
Genital	3.0	8.5	11.5			—
Urogenital	1.4	1.3	2.7			—
Operations—						15.0
Throat						15.3
Circumcision						0.8
Hernia						1.1
Appendix						0.6
Others						0.3
Gonorrhœa						0.3

¹ This period corresponds to the coming into operation of the *Child Welfare Act* raising the age to under eighteen instead of sixteen years.

TABLE II.—TYPES OF OFFENCES AND SEX INCIDENCE, 1924-1925-1926. NUMBERS PER AGE AND PERCENTAGE OF ALL.

Ages.	Boys.					Girls.				
	Slight.		Serious.		Total.	Slight.		Serious.		Total.
	Number.	Percent-age.	Number.	Percent-age.		Number.	Percent-age.	Number.	Percent-age.	
9	76	1.6	133	4.7	209	19	2	0.5		21
10	147	3.2	196	7.0	343	13	7	1.8		20
11	173	3.8	319	11.3	492	22	13	3.4		35
12	298	6.6	346	12.2	644	22	15	4.0		37
13	418	9.2	397	14.0	815	42	26	7.0		68
14	1,021	22.2	409	14.5	1,430	63	61	16.0		123
15	979	21.7	359	12.6	1,338	102	102	36.6		227
16	815	18.0	334	11.8	1,149	102	91	24.0		193
17	785	17.0	260	9.2	945	91	60	16.0		151
Totals	4,542		2,825		7,367	498	377			875

physical defect and inefficiency, form the background.

The main stream alike of truancy and delinquency comes from the metropolis, not the country; from the crowded industrial city population rather than the residential suburbs.

The valuable control and protection that the school affords is shown by the rise of delinquency with the end of compulsory school life. The apex of the curve of the delinquency is at fourteen to fifteen in boys and fifteen to sixteen in girls.

At puberty and at the end of primary school life a definite rise occurs in slight offences in boys, but in girls the rise occurs in serious offences and delinquency becomes proportionately more frequent in the older girls than in the older boys when compared with the incidence in the school ages. At the school ages only about 4% of delinquents at each age are girls involved in serious charges, whereas they form 28% of serious charges at the ages fifteen and sixteen.

That this is a secondary sex phenomenon is emphasized by the relative frequency of gonorrhœa in girl delinquents and also of sex incontinence.

Failure in parental life chiefly acts indirectly. The boy with an unsatisfactory home life becomes a street boy, member of a push or gang; in this unsavoury companionship he goes through the probationary life of the true criminal. Picture shows supply suggestions in a way books rarely do. The new world into which, without guidance, the boy and girl find themselves is an uncharted course. Progress is possible only by saving the boy or girl from the push and bad companionship.

The importance of feeble-mindedness has often been exaggerated, but should not be neglected. Of truants 8% were definitely feeble-minded; of delinquents 5%. Delinquents definitely and probably mentally defective equal 10.6% and including suspicious cases the total suitable for education at a special school is 17%. In metropolitan schools we expect to find at most 1% to 1.5% suitable for special education; so that the mental defective's chance of becoming a delinquent is probably at least twelve times that of the ordinary normal boy. This quota of mental defectives would best be segregated in a special school for mental defectives. Their suggest-

TABLE III.—PERCENTAGE SEX INCIDENCE SERIOUS TO TOTAL DELINQUENCIES PER AGE.

Age.	Boys.	Girls.
9	66	9
10	57	33
11	65	37
12	53	40
13	48	38
14	28	49
15	26	45
16	28	47
17	28	39
Average Total	38%	42%

This table shows the marked differences occurring after school age and puberty, the proportion of serious offences in girls increasing but decreasing in boys.

ibility and relative instability may render them easy marks for the professional criminal to annex.

A word may be said concerning the mental tests. The Binet test for under twelve to thirteen years old, for example, works admirably. On those over thirteen years of age, it is not so successful and more practical tests with a minimum of educational material are needed. Again, the time taken for Binet testing means one hour's close work and about five children a day. The majority of retarded children are fairly normal and need no institution.

To subject a normal child to the Binet test is a waste of time. This may be averted by first excluding the normals by group tests and then Binet testing the 20% to 35% left as abnormals. The saving of time is considerable. A programme of twenty-five Binet tests, a week's work usually, with group tests can be reduced to six or about a day and a half's work. This use of group tests to eliminate normals is a real practical advance.

Programme for the Future.

If medical and psychological investigation is to have its full value for the benefit of the individual and the community and for the guidance of court, educational or other authorities, a complete reorganization of effort is essential.

Every delinquent (at least every serious delinquency) should be investigated by a team of three, psychiatrist, psychologist and probation officer (social worker).

The medical training of the psychiatrist who should be experienced with children and with the diagnosis of mental defect, will be of aid first in making a thorough physical estimate, especially of those defects known to have an influence on educational progress and on health development, such as nose and throat defect and defective hearing, not forgetting those associated with mental instability, such as rickets, epilepsy and encephalitis. Secondly, he will watch for anomalies of growth reflecting endocrine disturbance and make an estimate of the physical age of the individual. Thirdly, he will report on special clinical types of mental behaviour (including various phases of sex aberration), for example, epilepsy, encephalitis. Fourthly, venereal

TABLE IV.—COMPARISON OF BOYS WITH GIRLS. GIRLS AS A PERCENTAGE OF THE BOYS' FIGURES PER AGE.

Age.	Slight.	Serious.	Total.
9	25	1	10
10	9	3	6
11	12	4	7
12	7	4	5
13	10	6	8
14	6	15	8
15	12	28	16
16	12	27	17
17	11	23	16
Total Average	11	13	12

Totals dealt with by the magistrate, Mr. W. Fincham, at the Court for 2½ years, 9,555, consisting of 8,627 boys and 928 girls, or 100 boys to every 10.7 girls.

This table shows a slight doubtful proportionate increase in slight offences, but a very definite and significant increase after school age and puberty in girls.

TABLE V.—INTELLIGENCE QUOTIENTS BY THE BINET TEST.
PERCENTAGE RESULTS.

Intelligence Quotients.	Truants (Guildford)	Delinquents 1921-1923.	Children's Court (Dr. C. P. Stewart), 1924-1926.	
Totals ..	361	1,088	1,912	3,000
Under 70 ..	8	4.2	5.2	4.8
71-75 ..	29	6.2	5.5	5.8
76-80 ..		6.9	6.2	6.4
81-90 ..	30	35.6	24.7	28.5
91-100 ..	36	28.7	35.5	32.9
101-110 ..		18.4	23.0	21.7
111 and over	5			

	Delinquents.	Truants.
Probably feeble-minded ..	10.6	8+
Suitable for special education ..	17.0	37
Distinctly backward ..	28.5	30
Total retarded ..	45.5	67
Normal or bright ..	54.6	41

The ordinary finding in a metropolitan school does not exceed 13% as "suitable for a special school." The finding in better class suburbs as against central congested districts is nearer 1%.

disease, especially in girls, must be inquired about and tested, if necessary. Fifthly, the diagnosis of feeble-mindedness and the estimate of capacity for responsible conduct as possibly influenced by these various factors will be the main idea of the collaboration of the psychiatrist and psychologist.

The parent should be seen to furnish details of the whole previous history, medical and developmental, of the child.

The psychologist should be the collaborator and officer of the psychiatrist and should have a first-hand acquaintance with educational methods and organization.

His duties should include the routine estimation of the intelligence quotient, first by a preliminary elimination of normals by means of group tests and second by the testing of abnormals by the Binet method and other tests.

He should obtain details from the head teachers of schools attended by the child; of work in school, behaviour, irregular attendance and so forth. The linking-up of work among truants and in the various institutions may readily be undertaken by him.

One urgent need is the outlining of further more suitable mental tests for the older ages.

TABLE VI.—THE CHILDREN'S COURT—FAMILY AND PARENTAL FAILURE.

Parents.	Percentage of Defective Families.		Percentage of all Children.	
	Father.	Mother.	Father.	Mother.
Dead ..	37.3	22.2	15.6	9.3
Divorced ..	3.2	2.1	1.3	0.9
Separated (children with other parents) ..	11.0	3.1	4.6	1.3
Deserted ..	13.0	3.1	5.4	1.3
Both dead (4.6%) ..				
Total ..	64.5	30.5	26.9	12.7

Of 2,825 boys 4.1% were illegitimate; of 380 girls 8.5% were illegitimate. Of 2,712 legitimate boys the parents were not alive or not living together in 39.8%. Of 350 girls (legitimate) 44.5%. Of 1,248 families, there were 41.5% with the parents not alive or living together out of a total of 3,011 children. The disturbance in family life by parental failure from any cause and the effect of lack of parental guidance reinforced by poverty is well shown. The father more definitely represents the disciplinary side. The higher sex disproportion in separated and deserted cases is probably due to the necessity for the mother to work for her living and her consequent inability to give adequate supervision.

TABLE VII.—TRUANT SCHOOL, GUILDFORD.¹

(Figures from about 963 children, mainly eleven to thirteen years of age. Of first admissions 24% were delinquents and 27% of readmissions.)

Poverty.	Admissions.	Readmissions.
Very poor ..	64%	74%
Poor ..	31%	22%
Comfortable ..	5%	4%
Size of Families.	Admissions.	Readmissions.
Four and under ..	39%	34%
Five to eight ..	50%	51%
Nine to twelve ..	10%	13%

	Parental Failure (First Admissions).		Percentage Figures (Readmissions).	
	Father.	Mother.	Father.	Mother.
Dead ..	12	6	14	5
Deserted ..	9	2	7	1
Stepfather or Stepmother ..	5	2	4	5
Other causes ²	26% 9%	10%	25% 10%	11%

¹From the annual report of the Truant School, Guildford (Mr. Dawson, Superintendent).

²Other causes include: Both parents dead, two and two; illegitimate, three and three; crippled, one and one and a half; divorced, one and one and a half; insane, two and two. Normal family relationship, 55% and 58%.

The probation officer (social worker) is by no means the least important member of this triumvirate. He should work in close association not only with the court, but also with the psychiatrist and psychologist. The importance of satisfactory home life in the prevention of delinquency cannot be overestimated. The neutralization of gang or "push" influence where the home fails to effect this becomes the duty of the social worker. It is the impact and support of personality that can do so much to prevent the recurrence of this dislocation of conduct and character. He must have personality, tact and understanding of boys and girls. Above all he should be a social investigator of experience and in this way provide valuable information for his scientific confrères. He is the field worker in this social laboratory and the analysis of

the influence, both of heredity and environment, is his in the final issue.

This paper is a plea for the breaking down of the water-tight compartments into which workers have so often fallen. Not one of the three can satisfactorily cover the whole field of investigation. The work of each suffers from the lack of help from the other two and the dearth of vital information.

While the court must and will continue as the main centre for investigation and organization, the most important preventive measures will be the attack on truancy. Every child not attending school should be medically and, if necessary, psychologically tested and attendance at school enforced. This round-up of children not attending school would throw a great deal of light on mental defectives and physical defects such as cripples.

The compulsory age in children, especially girls, should be raised to sixteen and later eighteen years. Not only is the school a definite protection, but vocational training and guidance should do much to reduce unemployment or irregular jobs or dead-end occupation. Early adolescence is a critical and unstable period which could be controlled readily in this way.

CRIME AND INSANITY.

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For the purposes of this paper a criminal is taken to mean a person who commits an offence against the State, its citizens or their property; whilst by an insane criminal is meant a criminal who is suffering from some form of mental disease.

The study of criminal insanity has excited great interest, especially in America, during recent years. It was confined at first to a study of the grosser forms of insanity in criminals and has been extended further and further until those who undertake it, seek to understand the psychology of each and every prisoner. It is a subject with numerous ramifications and in this paper I can hope to give only an incomplete and somewhat sketchy outline of the whole subject.

Insane criminals are readily divisible into two classes: the congenital mental defectives and those with other forms of mental disease.

The Mental Defectives.

In my experience in various mental hospitals in New South Wales I have found that about 50% of all insane criminals are mentally defective. In America it is estimated that about 25% of all prisoners are mentally defective.⁽¹⁾ The high percentage in my series is undoubtedly due to the fact that in New South Wales the estimation of a prisoner's mentality is left almost entirely to the non-expert

observation of the judge and very often to that of the visiting gaol surgeon who has had as a rule no special training in psychiatry. In this way only obvious defectives (who form a large percentage of my series) and psychotics are detected and certified and thus come under the observation of medical officers in mental hospitals. High grade defectives and the less easily detected psychotics as a rule escape detection and are only rarely found in criminal mental hospitals.

The crimes committed by mental defectives are generally crimes of violence, murder, various sexual offences, thieving and robbery, especially among higher grade defectives. Such crimes arise from the fact that, whilst mentally defective prisoners have normal or even exaggerated instinctive tendencies, their degree of mental development is insufficient effectively to control these tendencies. This is why we find low grade imbeciles so frequently committing sexual offences, especially on children. They yield most readily to their most powerful instinct and prey on the weak *faute de mieux*.

On the other hand morons rarely commit sexual offences. They indulge rather in burglary and thieving. I have seen murderers belonging to this class and in every case the murder has resulted from uncontrolled passion and anger.

Mental defectives rarely show much premeditation in their crimes. They rarely have the ingenuity with which to cover their tracks and their detection is as a rule easy.

Recently though the encouragement of Dr. Hogg, Inspector-General of Mental Hospitals in New South Wales, I have had the opportunity of examining a number of prisoners in the Observation Ward of the State Penitentiary, Long Bay. I have found a number of these prisoners with a mental age from ten to twelve years. Some of them have had long police records. The impression one gets from such prisoners is that they are simple, easily led and are devoid of ambition, whilst their general knowledge is confined almost solely to that of their own environment in life. In hospital, in prison such defectives make as a rule model patients. They are excellent workers and are most amenable to discipline. In private life I think that many of them are the victims of their environment and are swayed to a life of crime by the encouragement of their more intellectual colleagues in crime.

The method I have followed in estimating the intelligence of a patient is by the use of the Terman modification of the Binet-Simon tests, together with test of general knowledge culled from various textbooks. The advantage of using a standardized method of examination is that one is enabled to compare exactly the patient's mentality with the normal standard of intelligence. This is an advantage which far outweighs any disadvantages the method may have. If necessary one's results can be verified by a careful history of the patient's schooling by tests such as the Otis system, the Porteus system or by Phillip's system which was devised for use in Australian schools.

(To be continued.)

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